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AERONAUTICAL ENGINEERING

A SPECIAL BIBLIOGRAPHY WITH INDEXES

Supplement 55

MARCH 1975

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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NASA SP-7037 (55)

AERONAUTICAL ENGINEERING

A Special Bibliography

Supplement 55

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in February 1975 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*

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INTRODUCTION

Under the terms of an interagency agreement with the Federal Aviation Administration this publication has been prepared by the National Aeronautics and Space Administration for the joint use of both agencies and the scientific and technical community concerned with the field of aeronautical engineering. The first issue of this bibliography was published in September 1970 and the first supplement in January 1971. Since that time, monthly supplements have been issued.

This supplement to *Aeronautical Engineering—A Special Bibliography* (NASA SP-7037) lists 260 reports, journal articles, and other documents originally announced in February 1975 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*.

The coverage includes documents on the engineering and theoretical aspects of design, construction, evaluation, testing, operation, and performance of aircraft (including aircraft engines) and associated components, equipment, and systems. It also includes research and development in aerodynamics, aeronautics, and ground support equipment for aeronautical vehicles.

Each entry in the bibliography consists of a standard bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged in two major sections, *IAA Entries* and *STAR Entries*, in that order. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the slight variation in citation appearances.

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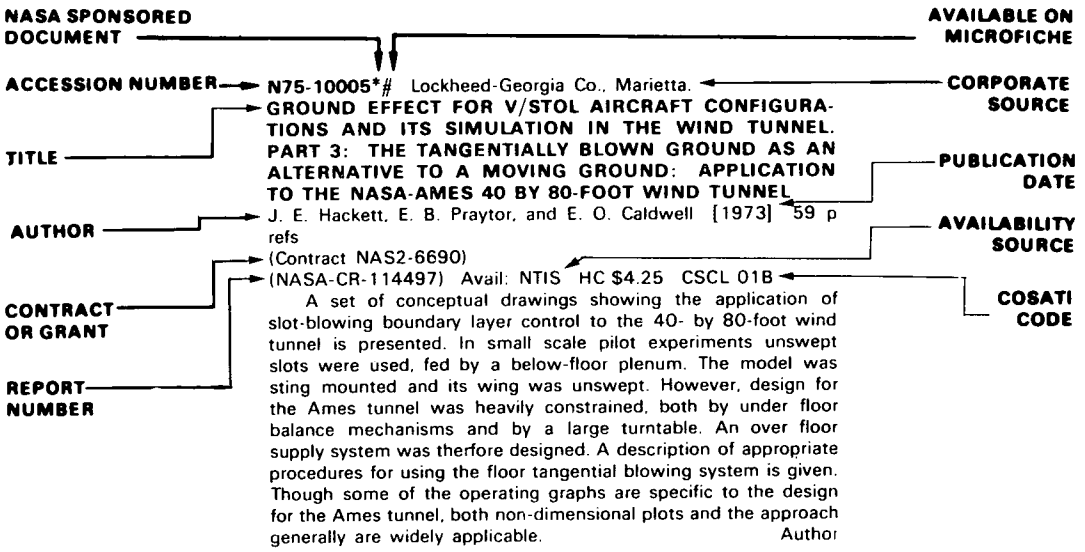

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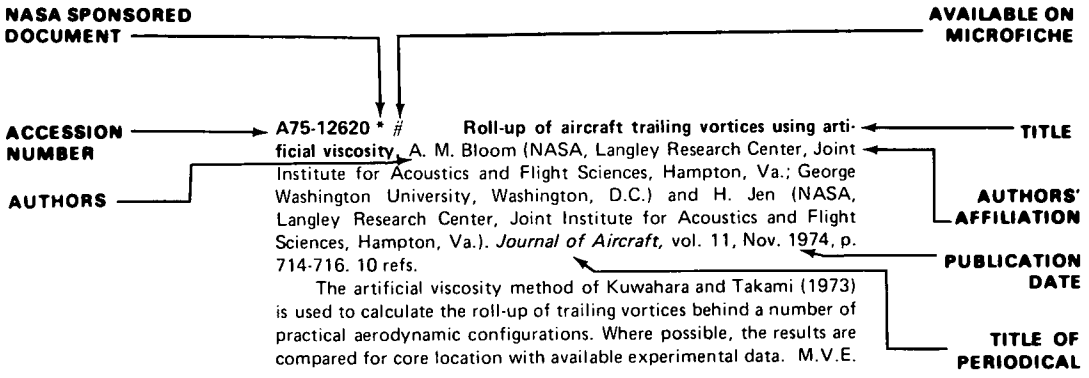

AERONAUTICAL ENGINEERING

A Special Bibliography (Suppl. 55) MARCH 1975

IAA ENTRIES

A75-13218 # **Aviation engine ASH-82V (Aviatsionnyi dvigatel' ASH-82V).** A. D. Bogdanov, P. D. Bondarenko, and Iu. A. Stepanov. Moscow, Izdatel'stvo Transport, 1974. 302 p. In Russian.

Basic information about the engine is considered along with details regarding the cylinders and the pistons, the connecting rod and the crankshaft, questions of gas distribution, the supercharger, aspects of constant-pressure regulation, and the engine crankcase. Other topics discussed are related to the driving gear mechanism, the lubrication system, the cooling system, the fuel system, the ignition system, the system for starting the engine, and questions of engine replacement. G.R.

A75-13219 # **Automatic control of the longitudinal motion of an elastic aircraft (Avtomaticheskoe upravlenie prodol'nym dvizheniem uprugogo samoleta).** G. M. Kashin and G. I. Fedorenko. Moscow, Izdatel'stvo Mashinostroenie, 1974. 312 p. 51 refs. In Russian.

The dynamics of an elastic aircraft using an automatic control system is discussed. Modern methods for the analytical representation of (elastic) aircraft models are outlined, together with methods of calculating aircraft aerodynamic characteristics under subsonic and supersonic flight conditions, for steady and unsteady motion, and in the presence of vertical gusts. Control systems conventionally used on aircraft of this type are described. V.P.

A75-13222 # **Cargo shipments by the air transport system of the USSR: Organization, technology, and economics (Gruzovye perevozki na vozdushnom transporte SSSR: Organizatsiia, tekhnologiia, ekonomika).** A. A. Kriuchkov. Moscow, Izdatel'stvo Transport, 1974. 247 p. 48 refs. In Russian.

The present work describes the main aspects of the Soviet air cargo system, with emphasis on the conveyance of goods requiring urgent delivery, such as perishable goods, radioactive materials, and other special kinds of goods. A method for normalizing natural loss of highly perishable goods is described. Recommendations are made for the implementation of automatic control systems for monitoring and planning freight transportation by air. P.T.H.

A75-13243 **Evolution keeps aircraft hydraulics youthful.** M. J. Walters, B. F. Aumiller, and W. B. Maddox (Lockheed-Georgia Co., Marietta, Ga.). *Hydraulics and Pneumatics,* vol. 27, Nov. 1974, p. 65-68.

The original hydraulic system for the C-130A was completed in 1951. A redesigned system for the C-130B was completed in 1957. System changes included elimination of redundant subsystems, component relocations, and provision for an electric-motor driven auxiliary hydraulic pump instead of an air-turbine motor driven pump. The redesigned system is continuously updated component-by-component. Improvements include fluid sampling valves to check on system contamination levels, time-delay shuttle valves to prevent short-duration surges from shuttling the valves, miniaturized components, a new aluminum alloy, an integral downlock in the nose landing gear actuating cylinder, and a snubber cylinder for the aft cargo door actuation cylinder. A.T.S.

A75-13279 # **Dynamic properties of wing panel made of composite materials (Dinamicheskie svoistva paneli kryla, izgotovlennoi iz kompozitsionnykh materialov).** A. S. Vol'mir, A. T. Ponomarev, and S. A. Popytalov. *Mekhanika Polimerov,* July-Aug. 1974, p. 662-669. In Russian.

The dynamic response to discrete vertical gusts is studied for a single wing panel filled with composite materials and moving at supersonic speed. Geometric nonlinear equations of shallow orthotropic shells and numerical methods of linearized nonstationary aerodynamics are used. The diagrammed numerical results reflect laws of deformation of the middle surface and the distribution of pressure and its development in time. Curves characterize the movement of separate points as a function of the parameters that reflect the anisotropic features of the panel. T.S.

A75-13293 **Precision clocks as a basis for a navigation system.** S. S. D. Jones (Royal Aircraft Establishment, Radar Dept., Farnborough, Hants., England). In: Collision avoidance and rendezvous navigation; Proceedings of the International Congress, Hanover, West Germany, October 2-5, 1973, Volume 2.. Düsseldorf, Deutsche Gesellschaft für Ortung und Navigation, 1974. 13 p. 5 refs.

Aspects of an interaction between navigation and the technology of time measurement are examined, giving attention to changes in the requirements of time-measurement accuracy connected with a transition from celestial navigation to radio navigation. The performance of present-day equipment with respect to frequency control and, by implication, time measurement is currently adequate for the requirements of avionics navigation. The cesium frequency standard provides frequency control of an order of 1 part in 100 billion. G.R.

A75-13294 **Developed methods of synchronisation of navigation and collision-avoidance systems.** J. Besson and P. Sannier (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France). In: Collision avoidance and rendezvous navigation; Proceedings of the International Congress, Hanover, West Germany, October 2-5, 1973. Volume 2. Düsseldorf, Deutsche Gesellschaft für Ortung und Navigation, 1974. 23 p.

Certain navigation and collision-avoidance systems, both aeronautical and maritime, use the time-frequency technique. The modus operandi depends on maintaining a common time scale over a comparatively long baseline, each system being synchronized to a high degree of precision in the common time scale. ONERA has developed original methods of synchronization based on the use of a reference clock carried by an aircraft overflying the positions in which the clocks to be synchronized are located. The transmission of time between the station clocks and the reference clock can be effected by RF link or by optical (laser) link. Results are presented with details of the accuracies obtained. (Author)

A75-13295 **Rendezvous capability for U.S. Army collision warning system.** O. H. Schoenberger (U.S. Army, Electronics

Command, Fort Monmouth, N.J.). In: Collision avoidance and rendezvous navigation; Proceedings of the International Congress, Hanover, West Germany, October 2-5, 1973. Volume 2. Düsseldorf, Deutsche Gesellschaft für Ortung und Navigation, 1974. 16 p. 5 refs.

Questions regarding the mid-air collision problem are examined, taking into account commercial operations, military operations, and non-CAS preventable collision. Basic collision prevention methods make use of proximity warning, collision warning, and collision avoidance. The background of equipment development is explored, giving attention to device compatibility considerations, questions of operational employment, the feasibility of an azimuth capability, the performance parameters, a theoretical analysis of the collision warning device, and aspects of test and evaluation. The requirements for rendezvous capability are discussed along with the potential of a collision warning device for rendezvous operations. G.R.

A75-13297 Collision avoidance and the future of air traffic control. S. Ratcliffe (Royal Radar Establishment, Malvern, Worcs., England). In: Collision avoidance and rendezvous navigation; Proceedings of the International Congress, Hanover, West Germany, October 2-5, 1973. Volume 2. Düsseldorf, Deutsche Gesellschaft für Ortung und Navigation, 1974. 16 p. 7 refs.

The principles of air traffic control are examined, taking into account four basic techniques which can, in theory at least, be used to ensure the safety of traffic moving between the world's airports. The longitudinal spacing of traffic on an airway is considered and difficulties in relative navigation caused by the lack of adequate intention information are pointed out. The more general problem of a two-aircraft encounter in a melee situation is investigated. Violent evasive action is not usually necessary if both aircraft involved in an encounter are both fully equipped with collision avoidance logic. Questions of ground based air traffic control are explored. G.R.

A75-13298 Problems of air collision avoidance involving air traffic in Italy. G. F. Villa. In: Collision avoidance and rendezvous navigation; Proceedings of the International Congress, Hanover, West Germany, October 2-5, 1973. Volume 2. Düsseldorf, Deutsche Gesellschaft für Ortung und Navigation, 1974. 12 p.

The paper is based on research performed both in Italy and abroad relevant to problems connected with aircraft collision probability. The major part of the research works are based on parameters derived or to be derived from statistical measurements of air traffic intensity and type over the areas taken into consideration. The paper suggests that coordinated statistical measurements should be carried out on the air traffic in order to have them ready when the anticollision problems will be so great as to influence the air traffic intensity. It is forecast that such an influence will represent a great limitation in the air traffic for the near future. Consequently, it is necessary not to delay the statistical measurements much longer. (Author)

A75-13299 Digital synchronization for time synchronized collision avoidance systems in air transport. P. Form (Braunschweig, Technische Universität, Braunschweig, West Germany). In: Collision avoidance and rendezvous navigation; Proceedings of the International Congress, Hanover, West Germany, October 2-5, 1973. Volume 2. Düsseldorf, Deutsche Gesellschaft für Ortung und Navigation, 1974. 18 p. 9 refs.

The concept of ATA collision avoidance is considered along with details regarding the technique for synchronized transmission and measurement, the suitability of CAS-synchronization signals for frequency synchronization on board, and aspects of digital synchronization of phase and frequency on board. The atomic clock on board is replaced by a digitally controllable frequency generator, also called 'synthesizer'. This generator shunts all necessary frequencies for the synthesis of the clock pulse frequency from a thermostat quartz oscillator as control oscillator. Limitations in the concept of time synchronized system are also discussed. G.R.

A75-13300 An air-traffic simulation model for the area around an airport, directed particularly toward the study of collision. S. Palmieri (Padova, Università, Padua; Aeronautica Militare, Rome, Italy), L. Gigli, C. Finizio, and A. Riccuci (Aeronautica Militare, Rome, Italy). In: Collision avoidance and rendezvous navigation; Proceedings of the International Congress, Hanover, West Germany, October 2-5, 1973. Volume 2. Düsseldorf, Deutsche Gesellschaft für Ortung und Navigation, 1974. 17 p.

An air traffic simulation model of the zone of space controlled by a general airport is presented. The optimum conditions for the functioning of the central system with particular attention given to collisions and airport capacity are examined. This model makes it possible to study collisions under certain environmental conditions, facilities, and traffic intensities. T.S.

A75-13301 Pilotage error and residual attention - The evaluation of a performance control system in airborne area navigation. C. O. Hopkins, S. N. Roscoe, and E. F. Kraus (Illinois, University, Urbana, Ill.). In: Collision avoidance and rendezvous navigation; Proceedings of the International Congress, Hanover, West Germany, October 2-5, 1973. Volume 2. Düsseldorf, Deutsche Gesellschaft für Ortung und Navigation, 1974. 19 p. 18 refs.

Questions of background information are briefly discussed, giving attention to area navigation, the protected airspace, the system error budget, and tradeoff incentives. Approaches for the measurement of pilotage error are examined, taking into account the test and measurement objectives, difficulties concerning the study of blunders, and the concept of residual attention. The development of a common metric for flight system evaluation is considered along with the conduction of the experiments. The frequencies of procedural blunders, the precision of flight control, and the residual attention of pilots while navigating and flying were found to vary in a consistent manner as a function of each experimental variable. G.R.

A75-13302 The security in automatic landing in poor visibility. J.-P. de Beauchene (Secretariat General à l'Aviation Civile, Paris, France). In: Collision avoidance and rendezvous navigation; Proceedings of the International Congress, Hanover, West Germany, October 2-5, 1973. Volume 2. Düsseldorf, Deutsche Gesellschaft für Ortung und Navigation, 1974. 23 p.

The representation of the aircraft by a linear model is considered along with details concerning the approach and landing modes, the principles of operation of ILS, and operational details of the automatic pilot. The concepts of all weather landing are examined and operational principles required by safety considerations are described. The organization of systems insuring safety is investigated, taking into account basic principles and the design of specific monitored systems. Attention is given to the SUDLEAR system, the AIR INTER, the double monitored 'fail operational' system used for the Concorde, and the quadruple system planned for the Airbus A 300 B. G.R.

A75-13303 Weather radar and landing aids. R. Gendreu. In: Collision avoidance and rendezvous navigation; Proceedings of the International Congress, Hanover, West Germany, October 2-5, 1973. Volume 2. Düsseldorf, Deutsche Gesellschaft für Ortung und Navigation, 1974. 22 p.

This paper describes the WILM multi-purpose radar (linked to three beacons on the ground) designed for installation in civil aircraft. The equipment, which takes the place of the standard weather radar, is installed without major modifications and is capable of performing the following functions: (1) assistance of all-weather landing, both as an independent aid and as monitor of the ILS

system; (2) detection of meteorological disturbances and ground features; and (3) terrain avoidance. The paper describes the principles and functioning of the independent landing monitor (ILM) and assesses the results obtained in flight with a prototype radar. The operational requirements to meet the above mentioned functions are discussed and also the possibilities for further development of the ILM system. (Author)

A75-13494 Israel Annual Conference on Aviation and Astronautics, 16th, Tel Aviv, Israel, August 25, 1974, Proceedings. Conference supported by the Israel Ministry of Transport, Israel Ministry of Defence Armament Development Authority, Israel Ministry of Commerce and Industry, et al. *(Israel Journal of Technology,* vol. 12, no. 1, 1974.) Jerusalem, Weizmann Science Press of Israel, 1974. 71 p.

Topics discussed include an appraisal of the future of transport aircraft, the elastoplastic behavior of a thin spherical shell under internal pressure, the possibility of roll stabilization by means of canard control surfaces, a theory of large-amplitude vibrations which includes the effect of nonlinear elastic constitutive relations, a model for determining the stress diffusion near the strut fitting of a strutted aircraft wing, and a method of determining the droplet size distribution in the spray of injector elements in combustion chamber processes.

A.B.K.

A75-13495 Selection of the fittest - The evolution and future of transport aircraft /Sixth Theodore von Karman Memorial Lecture/. R. S. Shevell (Stanford University, Stanford, Calif.). *(Israel Journal of Technology,* vol. 12, no. 1, 1974.) In: Israel Annual Conference on Aviation and Astronautics, 16th. Tel Aviv, Israel, August 25, 1974, Proceedings. Jerusalem, Weizmann Science Press of Israel, 1974, p. 1-22. 13 refs.

The service/cost index is seen as the major tool for predicting the success of commercial aircraft. Representative transport aircraft from each generation are considered with respect to functional capabilities (speed, safety, range, comfort, and operating cost) and technical features (take-off and landing field lengths, aircraft size, reliability, etc.). For technical, environmental, and economic reasons, several concepts promise no major impact in the foreseeable future. These are laminar flow aircraft, nuclear powered aircraft, STOL aircraft, and the SST. Significant commercial progress is likely in three areas: active control technology, to extend fatigue life, permit lower maximum design loads, and decrease structural weight; improved transonic (supercritical) airfoils, which offer higher Mach number for initial drag divergence for a given thickness, excellent structural shape, and high maximum lift coefficient; advanced filamentary composite materials (graphite or boron fibers in an epoxy binder or matrix), for superior strength- and stiffness-to-density ratios. A.T.S.

A75-13497 Roll control feasibility of a slender cruciform configuration by canard surfaces at Mach number 2.25. J. Shinar (Technion - Israel Institute of Technology, Haifa, Israel). *(Israel Journal of Technology,* vol. 12, no. 1, 1974.) In: Israel Annual Conference on Aviation and Astronautics, 16th, Tel Aviv, Israel, August 25, 1974, Proceedings. Jerusalem, Weizmann Science Press of Israel, 1974, p. 31-39. 13 refs.

Practical design constraints led to the use of canard surfaces for the aerodynamic control of a slender cruciform configuration. The control functions defined by mission requirements were programmed maneuvres in pitch and roll position control. Surveyed bibliography, based on previous experience, had predicted that due to wing-tail interference, canard roll control might not be practical. However, a qualitative study of the phenomenon - based on a simplified vortex model - indicated that in a carefully designed configuration roll stabilization by canard control surfaces can be achieved. Wind tunnel tests at Mach number 2.25 were run to confirm the conclusions of the qualitative analysis. The test results demonstrated that by proper choice of the aerodynamic design parameters a reasonable portion of the canard rolling moment can be used for roll control, at least for small side slip angles. (Author)

A75-13499 Stress diffusion of Arava wing in region of strut. K. Wander (Israel Aircraft Industries, Lod, Israel) and M. Baruch (Israel Aircraft Industries, Lod; Technion - Israel Institute of Technology, Haifa, Israel). *(Israel Journal of Technology,* vol. 12, no. 1, 1974.) In: Israel Annual Conference on Aviation and Astronautics, 16th, Tel Aviv, Israel, August 25, 1974, Proceedings. (A75-13494 03-01) Jerusalem, Weizmann Science Press of Israel, 1974, p. 49-56. 5 refs.

An approximate analysis of stress diffusion in the Arava wing is presented. The proposed method is based on the assumptions of finite diffusion lengths and hyperbolic stress delays. The results obtained from the analysis are compared with results obtained from experiments performed in the Israel Aircraft Industries. Fairly good agreement between analysis and experiment has been found. (Author)

A75-13651 Effect of inlet turbulence on compressor noise. B. Robbins (Pennsylvania State University, State College, Pa.). *International Astronautical Federation, International Astronautical Congress, 25th, Amsterdam, Netherlands, Sept. 30-Oct. 5, 1974, Paper ST74-14.* 11 p. 9 refs.

The sound generated by the interaction of inlet turbulence with a rotating compressor blade row is investigated. Currently, there are two theories relating the rotor geometry and blade aerodynamics to the spectrum of the radiated sound. To experimentally study this noise source, an aeroacoustic compressor facility was designed and built. The parameters investigated include turbulence intensity and longitudinal integral length scale, blade speed, flow coefficient, and blade spacing. The results indicated a definite increase in the overall sound pressure level and an increase in the spectrum level of the sound pressure with an increase in turbulence intensity. Comparison of theoretical results with experimental data indicated one theory to predict the sound pressure level fairly accurately in a limited frequency range. The experimental results clearly show that increased distortions in the inlet flow of a compressor produce higher noise levels. The spectrums of the sound pressure level produced by these distortions can be predicted in a limited frequency range. (Author)

A75-13657 The design of submersible seaplanes. B. S. Papadales, Jr. (Virginia Polytechnic Institute and State University, Blacksburg, Va.). *International Astronautical Federation, International Astronautical Congress, 25th, Amsterdam, Netherlands, Sept. 30-Oct. 5, 1974, Paper ST74-17.* 17 p. 21 refs.

A study was conducted to design a practical submersible seaplane which could fulfill civilian marine missions in the 1970-1990 time period. A preliminary investigation was conducted to determine the required technology base; results showed a practical design could be built after 1980. A computer-assisted analysis determined the approximate vehicle size and performance. A detailed design was derived from these results. The final design had a gross weight of 40,000 kg, of which 4000 kg was assigned to payload. The wing had an area of 97.3 sq m with an aspect ratio of 9.07. Furthermore, the wing could be rotated 90 deg to reduce the span for submerged operations. Propulsion was supplied by two turbofans (for flight) and two electric motors and ducted propellers (for submerged travel). A maximum airborne range of 3900 km was possible; a maximum undersea range of 150 km was predicted. A crew of two was specified. An air cushion landing system was employed to permit operations from either land or sea. (Author)

A75-13883 # **Developmental trends in the production of powered gliders (Tendencje rozwoju produkcji motoszybowcow).** W. Waskowski. *Technika Lotnicza i Astronautyczna,* vol. 29, Oct. 1974, p. 6-11, 34. 16 refs. In Polish.

The history of the production, development, and application of powered gliders is reviewed, together with some notable exploits achieved with some obsolete powered gliders in the 1930s. The increasing interest in two-seated powered gliders is noted, and an attempt is made to predict the demand for powered gliders of various classes up to 1990. V.P.

A75-13884 # **High-altitude gliders - Projects and reality (Szybowce wysokosciowe - Projekty i rzeczywistosc).** T. Wusatowski. *Technika Lotnicza i Astronautyczna,* vol. 29, Oct. 1974, p. 12-16. In Polish.

The projects of the high-altitude gliders Alcor and two Stratosailplane versions are discussed, with particular reference to design concepts, the equipment of the pressurized cabin, and the physiological aspects of high-altitude flights. Some test results obtained with the Alcor glider are examined. V.P.

A75-13885 # **Possibilities of analytical evaluation of the effectiveness of inertial radial dust separators (Mozliwosci analitycznej oceny skutecznosci bezwladnosciowych odpylaczy promieniowych).** S. Szczecinski and R. Wiatrek. *Technika Lotnicza i Astronautyczna,* vol. 29, Oct. 1974, p. 17, 18, 25, 26. In Polish.

An analytical approach is proposed for evaluating the effectiveness of a radial air purifier of the type used at the turbine inlet onboard the Sea King helicopter. The accuracy of the approach is shown to be sufficient for engineering purposes. V.P.

A75-13886 # **Some problems of the canard system. II (Niektore problemy ukladu kaczki. II).** J. Staszek. *Technika Lotnicza i Astronautyczna,* vol. 29, Oct. 1974, p. 27-30, 34. In Polish.

The influence of the canard control surfaces on the aerodynamics of the wing is analyzed, along with the stability of the canard configuration in pitch and roll. The influence of vertical gusts on the loads is examined, and a number of considerations which should be taken into account in the design of canard aircraft are noted. V.P.

A75-14036 # **Canadian civil aircraft maintenance from a regulatory viewpoint.** J. F. Mew and D. C. Parke (Ministry of Transport, Ottawa, Canada). *(Canadian Aeronautics and Space Institute, Annual General Meeting, Ottawa, Canada, May 13, 14, 1974.) Canadian Aeronautics and Space Journal,* vol. 20, Oct. 1974, p. 407-416.

The Ministry of Transport regulates maintenance and airworthiness certification of civil aircraft in Canada. The licensing regulations and certification privileges of Aircraft Maintenance Engineers (AMEs), who are responsible for certifying rotorcraft and smaller airplanes, are outlined. Operating companies are responsible for airworthiness certification of their transport-type aircraft. Maintenance of transport aircraft has evolved from the 'hard time' overhaul concept to the 'on condition' and 'reliability program' concepts. Introduction of the Boeing 747 prompted the 'condition monitoring' concept having neither hard time limits nor on condition maintenance process with respect to system components. Air Regulations and Air Navigation Orders are listed in an appendix. A.T.S.

A75-14103 # **Compressible laminar boundary layer at the leading edge of a swept wing in the presence of heat transfer and suction (Szhimaemyi laminarnyi pogranichnyi sloi vblizi perednei kromki strelovidnogo kryla pri nalichii teploperedachi i otsasyvaniia).** A. N. Savoshchik and A. D. Tokhunts. *Akademiia Nauk SSSR, Izvestiia, Mekhanika Zhidkosti i Gaza,* Sept.-Oct. 1974, p. 27-33. 8 refs. In Russian.

A75-14142 # **Oblique compressible Sears function.** L. T. Filotas (Ministry of Transport, Ottawa, Canada). *AIAA Journal,* vol. 12, Nov. 1974, p. 1601-1603. 11 refs.

The lift response of a thin, infinite-span wing flying subsonically through a stationary sinusoidal gust at an arbitrary angle to the lines of constant phase is discussed. A formula is presented that interpolates between known analytical expressions for the oblique compressible Sears function. The values obtained indicate that the increase in lift curve slope with increasing Mach number is reversed if the Mach number is greater than twice the reduced frequency taken to the one-half power. T.S.

A75-14217 # **Characteristics of pressure fluctuations during distributed suction of a turbulent boundary layer (Kharakteristiki fluktuatsii davleniia pri raspredelennom otsasyvanii turbulentnogo pogranichnogo sloia).** L. M. Liamshev, M. G. Puzino, and S. A. Salosina (Akademiia Nauk SSSR, Akusticheskii Institut, Moscow, USSR). *Akusticheskii Zhurnal,* vol. 20, Sept.-Oct. 1974, p. 733-737. 10 refs. In Russian.

Results of laboratory studies of the effect of distributed suction of fluid from a turbulent boundary layer on the spectral and correlation characteristics of wall pressure pulsations on a wing model (NACA-0012). It is shown that an increase in the rate of distributed suction of fluid from a developed turbulent boundary layer leads to a decrease in the longitudinal spatial correlation and a decrease in the spectral power density of wall pressure pulsations in the low-frequency range. On the other hand, the correlation characteristics of wall pressure pulsations are not affected by suction of fluid from the boundary layer in the high-frequency range. A.B.K.

A75-14339 **Army helicopter fluidic control systems.** R. P. Smith (U.S. Army, Air Mobility Research and Development Laboratory, Fort Eustis, Va.). *Fluidics Quarterly,* vol. 6, July 1974, p. 53-70. 9 refs.

Due to the absence of electronic complexity and spin motor type gyros, hydrofluidic systems, which use hydraulic oil as the operating fluid, are able to achieve reliability levels not possible with conventional systems. It is expected that these hydrofluidic systems will become operational equipment on current and future helicopters in all classes from light to heavy. Aspects of Army design philosophy for aviation applications are discussed along with a number of hydrofluidic stability augmentation systems. Questions of design optimization are considered and attention is given to an establishment of the limits of hydrofluidic capability. G.R.

A75-14346 * # **Rating aircraft on energy.** D. V. Maddalon (NASA, Langley Research Center, Aeronautical Systems Div., Hampton, Va.). *Astronautics and Aeronautics,* vol. 12, Dec. 1974, p. 26-43. 18 refs.

Questions concerning the energy efficiency of aircraft compared to ground transport are considered, taking into account as energy intensity the energy consumed per passenger statute mile. It is found that today's transport aircraft have an energy intensity potential comparable to that of ground modes. Possibilities for improving the energy density are also much better in the case of aircraft than in the case of ground transportation. Approaches for potential reductions in aircraft energy consumption are examined, giving attention to steps for increasing the efficiency of present aircraft and to reductions in energy intensity obtainable by the introduction of new aircraft utilizing an advanced technology. The use of supercritical aerodynamics is discussed along with the employment of composite structures, advances in propulsion systems, and the introduction of very large aircraft. Other improvements in fuel economy can be obtained by a reduction of skin-friction drag and a use of hydrogen fuel. G.R.

A75-14384 **NEF contours for continuous spread of flight paths.** P. Mansbach (Polysonics Acoustical Engineers, Washington, D.C.). *Acoustical Society of America, Journal*, vol. 56, Nov. 1974, p. 1497-1500. Research supported by the Urban Systems Development Corp.

NEF contours for aircraft noise have generally been computed assuming three or four well-defined flight paths from a given runway. In fact, a whole continuum of flight paths normally exists. In this paper, methods are developed to treat this continuum of flight paths. Simplifications are also suggested which provide realistic approximations and which allow preliminary calculation of NEF values without the need for major computer programming. These have the form NEF = NEFC + correction, where NEFC assumes all flights are overhead, and a (negative) correction term is added for the splayout. Results of the conventional discrete path computations are contours shaped like fingers. Using a continuous spread of paths results in a single fanned-out contour. We feel the latter is more realistic. (Author)

A75-14466 # **A boundary value problem for a linearized axisymmetric VT equation (Ob odnoi kraevoi zadache dlia linearizovannogo osesimmetricheskogo VT-uravneniia).** V. N. Diesperov and L. A. Lomakin. *Zhurnal Vychislitel'noi Matematiki i Matematicheskoi Fiziki*, vol. 14, Sept.-Oct. 1974, p. 1244-1260. 13 refs. In Russian.

Construction of an explicit solution to a nonhomogeneous linearized viscous transonic (VT) equation in the case of axial symmetry. An exterior boundary value problem is solved for a VT equation of quasi-elliptic type with the aid of an integral representation of the perturbed velocity potential function and a differentiability analysis based on a well-known theorem concerning the differentiability of a limit function of a uniformly converging sequence. A.B.K.

A75-14475 # **High-performance composite material airframe weight and cost estimating relations.** D. F. Adams (Wyoming, University, Laramie, Wyo.). *Journal of Aircraft*, vol. 11, Dec. 1974, p. 751-757. 20 refs.

Estimates of the weight reduction potential of using advanced composite materials in high-performance aircraft airframes are presented. A conventional, all-aluminum airframe is established as the reference configuration for comparison purpose, with the alternate use of other homogeneous metals, viz, titanium and beryllium, also considered. Advanced composites discussed in detail include boron/epoxy, graphite/epoxy, and an organic filament/epoxy. Cost factors are estimated in order to keep the significance of the various weight reduction factors in proper perspective. Conventional sheet and stringer construction will eventually be modified to take advantage of the unique characteristics of composite materials in achieving maximum structural efficiency. Therefore, the influence of advanced construction technology on weight and cost factors is also considered. Numerical examples representing applications to specific vehicle airframes are presented, indicating the significance of the estimated airframe weight savings in terms of vehicle performance increases. (Author)

A75-14477 # **Warping of delta wings for minimum drag.** R. K. Bera (National Aeronautical Laboratory of India, Bangalore, India). *Journal of Aircraft*, vol. 11, Dec. 1974, p. 777-779. 5 refs.

A study was conducted of the possibility to use the results obtained by Bera (1974) in the design of wings of low drag. The case in which the wings are subjected to a given lift is investigated. The results of the study are presented in a number of graphs showing conical twist distributions, basic wing camber surfaces, optimum wing camber surfaces, and sample spanwise pressure distribution of basic and minimum drag shapes. (Author)

A75-14479 # **Comment on 'wind effects on electrostatic autopilots'.** M. L. Hill (Johns Hopkins University, Silver Spring, Md.) and W. A. Hoppel (Johns Hopkins University, Silver Spring, Md.; U.S. Navy, Naval Research Laboratory, Washington, D.C.). *Journal of Aircraft*, vol. 11, Dec. 1974, p. 781, 782.

An analysis conducted by Sullivan (1974) to describe velocity dependence characteristics is considered. It is believed that the analysis is based on an erroneous physical picture of the current generating mechanism. The suggestion is made that the velocity dependence arises from the removal of the 'shielding charge' which develops at the outer boundary of the region of high ionization. G.R.

A75-14536 # **Some techniques for decreasing variable aerodynamic forces acting on turbine rotor blades (O nekotorykh metodakh snizheniia peremennykh aerodinamicheskikh sil, deistvuiushchikh na rabochie lopatki turbin).** A. S. Laskin, V. F. Kondrat'ev, and N. D. Salivon. *Problemy Prochnosti*, Oct. 1974, p. 80-82. In Russian.

A75-14660 # **Evaluation of aircraft propulsion systems on the basis of data and characteristic values (Beurteilung von Flugzeugantriebsanlagen anhand von Daten und Kennwerten).** E. Schesky (Dresden, Hochschule für Verkehrswesen, Dresden, East Germany). *Technisch-ökonomische Informationen der zivilen Luftfahrt*, vol. 10, no. 5, 1974, p. 263-270. 7 refs. In German.

Problems involving the evaluation of gas turbine propulsion units for medium-range and long-range airliners are considered. Characteristic values of fuel utilization are discussed along with parameters regarding the utilization of lubricants, questions concerning the performance obtained with 1 kg of air used by the engine, the coefficient of material utilization, aspects of maintenance requirements, engine reliability, and environmental effects. G.R.

A75-14746 **A discussion of the roll-coupling problem.** T. Hacker and C. Oprisiu (Institutul de Mecanica Fluidelor si Constructii Aerospatiale, Bucharest, Rumania). In: Progress in aerospace sciences. Volume 15. Oxford and New York, Pergamon Press, 1974, p. 151-180. 37 refs.

The theory of the roll-coupling problem is considered, giving attention to the ideal case involving only steady rolling. The equations of motion are examined and the stability of steady-state solutions of a number of simplified systems is investigated, taking into account autorotational rolling, the stability of controlled steady rolling, and the fourth-order system with Phillips' criteria. An ideal maneuver and ideal controls to achieve it are discussed along with a number of numerical examples related to the general characteristics of the aircraft and the reference flight regimes. G.R.

A75-14806 # **Researches on the two-dimensional cascade. V - On the performance of flat-plate cascade.** T. Ikui, M. Inoue (Kyushu University, Fukuoka, Japan), and K. Kaneko (Saga University, Saga, Japan). *JSME, Bulletin*, vol. 17, Oct. 1974, p. 1260-1266. 9 refs.

The experimental performance of a flat-plate cascade has not been clarified, although the theoretical one was calculated by Weinig about 40 years ago. Reliable two-dimensional cascade data for thin flat-plate profiles have been obtained by means of the porous wall cascade tunnel testing technique. These results have been compared with Weinig's classical theory. The cascade interference coefficient coincides with the theoretical value in the case of a space-chord ratio smaller than unity. Some potential theories with respect to the effect of blade thickness have been also discussed based on the experimental data. Lastly, the available design diagrams for a flat-plate cascade have been presented. (Author)

A75-14892 **The control of adhesive bonding in the production of primary aircraft structures.** T. H. Norriss (Hawker Siddeley Aviation, Ltd., Chester, England). *Non-Destructive Testing,* vol. 7, Dec. 1974, p. 335-339.

Brief review of production control and materials used at Hawker Siddeley Aviation for adhesive bonded primary aircraft structures. Experience in metal-to-metal and metal-to-core assemblies bonding, and wood and plastics materials is discussed, with testing of test pieces carried out to destruction to obtain an indication of the bond strength. Some NDT is also carried out but only as a back-up due to the fact that NDT is able to detect accurately only voids in the bonding of structures. The method of ultrasonic resources is used to determine correlation curves for the cohesive bond strength. N.D.

A75-14922 # **Air Canada - The airline that knows what maintenance is all about.** G. H. Garbett. *Aircraft Engineering,* vol. 46, Nov. 1974, p. 4-10.

The Air Canada maintenance base in Montreal, including planning, quality control, and equipment and facilities, is described. Periodic minor and major aircraft checks are summarized and engine maintenance techniques and concepts are considered in detail. Reduced overhaul costs are attained by using 'on condition', rather than 'hard time', control for many parts which can be inspected without disassembly. Early failure detection and trend analysis are used to minimize non-predictable maintenance. Continuous condition monitoring includes flight-deck monitoring, monitoring run-down time, visual examination, and engine vibration monitoring. Engine stripping and testing procedures are described. A.T.S.

A75-14923 # **European TriStars.** T. E. Ford. *Aircraft Engineering,* vol. 46, Nov. 1974, p. 12-15, 24.

Basic features of the TriStar airliners to be used by British Airways, including engines, fuel tanks, landing gear, and pitch control, are described. The flight deck is designed for a 3-pilot crew. The Automatic Flight Control System has four subsystems: autopilot flight director, flight control electronics, stability augmentation, and speed control. The data system and control panels and displays are considered. The usual configuration will accommodate 320-330 passengers and 12 cabin attendants. Three cargo holds will have maximum allowable loads of 8165, 8165, and 4422 kg. Training operations utilize an engineering simulator, a flight simulator with 4-axis motion system, and a passenger cabin mock-up. Test equipment and ground handling and support facilities are considered.
A.T.S.

A75-14924 # **Single engine aircraft for multi-engined flying training.** K. W. Clark (Rolls-Royce /1971/, Ltd., Bristol Engine Div., Bristol, England). *Aircraft Engineering,* vol. 46, Nov. 1974, p. 20, 22-24.

A method developed for using a single-engine jet trainer to simulate an intermediate twin-engine aircraft is explained. The concept involves the use of dual throttle levers arranged to provide 'sum,' 'difference,' and 'individual' signals and a thrust deflector at the engine tailpipe. Cockpit layouts, thrust requirements, throttle lever systems, and actuating systems are considered. Merits of the system include eliminating the need for an intermediate twin trainer, ability to simulate various multiengine aircraft, reduced costs, servicing facilities, and spare parts, safety when simulating engine failure, and the ability to simulate thrust reverser or afterburner failure and 'negative excess thrust' situations. A.T.S.

A75-14925 # **Aircraft cleaning.** A. G. Waud. *Aircraft Engineering,* vol. 46, Nov. 1974, p. 25-27.

Aircraft cleaning services include three types of operations: cabin cleaning on turnaround, periodic deep cleaning, and exterior shampooing, chemical brightening, and skin polishing. During brief turnaround times, crews using mobile equipment units clean the passenger cabins and galleys, clean and disinfect toilets, and refill water systems. Deep cleaning of cabin, flight deck, galleys, and toilets requires 40-60 man hours for a Boeing 707. Exterior cleaning aids aircraft performance and preservation. Paint stripping, chemical brightening, and machine polishing are performed periodically.
(Author)

A75-15011 # **Soviet air cushion vehicles.** J. S. Dibbern (U.S. Army, Foreign Science and Technology Center). *(Canadian Aeronautics and Space Institute, Canadian Symposium on Air Cushion Technology, 8th, Toronto, Canada, Sept. 9-11, 1974.) Canadian Aeronautics and Space Journal,* vol. 20, Nov. 1974, p. 439-444.

Contemporary Soviet development work related to air cushion vehicles is concerned with three different categories. The development of Hovercraft-type vehicles has been mainly carried on by the military, although several civilian experimental vehicles have been produced. A second category consists of sidewall craft which are similar in principle to the U.S. Navy's surface effect ship. The third category involves low-flying, aircraft-like machines. G.R.

A75-15012 # **Depot level inspection and repair program and the CF101 Voodoo.** A. Hyland (Bristol Aerospace, Ltd., Winnipeg, Manitoba, Canada). *(Canadian Aeronautics and Space Institute, Annual General Meeting, Ottawa, Canada, May 13, 14, 1974.) Canadian Aeronautics and Space Journal,* vol. 20, Nov. 1974, p. 445-448.

The first two CF101 aircraft commenced sampling inspection at Bristol in 1964. Based on the findings of this sampling inspection, a program was written for the second cycle of depot level maintenance. This concept of aircraft sampling inspection was used again for the third cycle. Questions regarding the use of the depot level inspection and repair program are discussed. G.R.

A75-15013 # **An airline's approach to obtaining mechanical reliability through maintenance and engineering procedures.** R. L. Lake (Pacific Western Airlines, Ltd., Vancouver, Canada). *(Canadian Aeronautics and Space Institute, Annual General Meeting, Ottawa, Canada, May 13, 14, 1974.) Canadian Aeronautics and Space Journal,* vol. 20, Nov. 1974, p. 449-454.

Details regarding the technical services organization are discussed along with aspects of the check system and approaches for ensuring the reliability of components and accessories. Questions of monitoring and reviewing are considered, taking into account aircraft maintenance monitoring, engine condition monitoring, and the service review of the mechanical performance of the fleet. G.R.

A75-15014 **Aerospace mounts for down-to-earth optics.** C. A. Richey (Lockheed Electronics Co., Inc., White Sands Missile Range, N. Mex.). *Machine Design,* vol. 46, Dec. 12, 1974, p. 121-127.

Advances in optical-system design made first for such space applications as orbiting observatories can also be used in ground-based optical systems. Such advances include new system-mounting methods involving the positioning of optical components to required tolerances without deforming them. The new system-mounting methods are discussed, giving attention to approaches for the practical implementation of the basic principles. G.R.

A75-15038 **Identification of helicopter parameters (Parameteridentifizierung von Drehflüglern).** B. Gmelin, J. Kaletka, and O. Rix (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmechanik, Braunschweig, West Germany). *Zeitschrift für Flugwissenschaften,* vol. 22, Nov. 1974, p. 367-372. 10 refs. In German.

Parameter identification employing a hybrid computer is performed using a simulation of the Sikorsky S-61 helicopter as baseline data. The solution technique was successfully used in the Institute for Flight Mechanics of DFVLR for the evaluation of flight test data obtained from fixed wing aircraft. The relationship between the given inputs to the simulation and the resulting derived parameters is discussed in particular. The results are presented graphically showing pole distribution and some frequency and time responses. (Author)

A75-15040 **Fuel supply for supersonic combustion (Zur Brennstoffzufuhr bei Überschallverbrennung).** H. Rick (München, Technische Universität, Munich, West Germany). *Zeitschrift für Flugwissenschaften,* vol. 22, Nov. 1974, p. 379-393. 14 refs. In German.

In connection with the energy supply of ramjet engines with supersonic combustion, the partial task of fuel supply by secondary injection is treated. This leads to the concept of a combined multi-jet injection. An injection with minimal loss for the main flow is obtained by several gaseous individual jets injected laterally into the primary flow. This injection method is approximately described by a calculation model and is experimentally tested in a short time test installation. (Author)

A75-15053 **The Lockheed TriStar - An operational overview /Fifteenth Fairey Memorial Lecture/.** L. E. Frisbee (Lockheed-California Co., Burbank, Calif.). *Aeronautical Journal,* vol. 78, Sept. 1974, p. 389-402.

The L1011 was originally designed to be a short-to-medium-range transport with large passenger capacity. The design evolution, and features such as fuselage cross-section selection, wing development, engine location and type, flight controls, avionics, construction, and structural testing are discussed. Aspects of maintenance and ground operations, including reliability and maintainability, are treated. Take-off, landing, and cruise performance and flight handling characteristics are considered. Future derivatives of the basic L1011 will include longer-range and longer-fuselage designs, as well as possible twin-engine aircraft. A.T.S.

A75-15173 # **Practical aerodynamics of the Ka-26 helicopter (Prakticheskaia aerodinamika vertoleta Ka-26).** K. N. Laletin. Moscow, Izdatel'stvo Transport, 1974. 192 p. 18 refs. In Russian.

The present work sets forth the aerodynamic basis of the lifting rotor, balancing, stability, and controllability of the Ka-26 helicopter in steady and nonsteady flight regime. Special attention is given to description of physical processes taking place during operation of the aircraft in various flight regimes and to characteristics of piloting the helicopter. Special aspects of the aerodynamics of coaxial helicopters are studied. P.T.H.

A75-15194 # **Calculation of flow past multi-component airfoils in perforated wind tunnel.** M. Mokry (National Research Council, Ottawa, Canada). *(Canadian Congress of Applied Mechanics, 4th, Montreal, Canada, May 28-June 1, 1973.) CASI Transactions,* vol. 7, Mar. 1974, p. 19-24. 14 refs.

The method of incompressible flow calculation by Hess and Smith is extended to flows about two-dimensional airfoils located inside a wind tunnel with perforated walls. Contour distributions of sources and vortices, used in the free air calculation, are replaced by distributions of influence functions, whose analytic solutions are given in a domain between two parallel perforated walls. Application of the airfoil boundary condition leads to a Fredholm integral equation of the second kind. The solution is applicable to multi-component airfoils of arbitrary shape and location between the walls. Computations for two test cases are presented to demonstrate the versatility and accuracy of the method. (Author)

A75-15195 # **Optimum internal shapes in hypersonic flow with variable skin friction.** R. Camarero (Sherbrooke, Université, Sherbrooke, Canada). *CASI Transactions,* vol. 7, Mar. 1974, p. 25-28.

Body shapes of minimum drag in hypersonic internal flows are obtained by means of the calculus of variations. The drag consists of a pressure term evaluated by means of the Newtonian formula, and a friction term calculated by means of a power law. Constraints are imposed on the length and diameter of the body. Least drag profiles are obtained for several values of the diameter ratio and average skin friction coefficient. These differ markedly from optimum external shapes and from the case without friction. Further, it is found that for a given friction parameter the allowable diameter ratio must lie within a certain range. (Author)

A75-15204 **An engine change with difficulties (Triebwerkwechsel mit Hindernissen).** W. H. Kuhl. *Flug Revue/Flugwelt International,* Dec. 1974, p. 22, 24. In German.

An engine had to be replaced in a Lufthansa DC-10 which, at the time, was located in Sydney, Australia. Arrangements were made with Alitalia to have a spare engine, which the Italian airline had available in Rome, flown in two sections to Sydney. The Lufthansa airliner was ready for takeoff with the new engine about 100 hours after the request for the engine change had been received. G.R.

A75-15205 **The determination of the flight performance of gliders (Flugleistungsermittlungen bei Segelflugzeugen).** H. Zacher (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Abteilung Segelflug und Leichtflugzeuge, Munich, West Germany). *Flug Revue/Flugwelt International,* Dec. 1974, p. 39, 40. 22 refs. In German.

The specific flight characteristics of gliders are considered as a basis for the development of suitable approaches for the determination of glider flight performance. Methods for glider performance evaluation are an important aid in the further improvement of glider design. Auxiliary devices for obtaining glider flight performance data are discussed along with certain problems regarding the flight tests and their solution. G.R.

A75-15217 **Analytical approach to size and notch-size effects in fatigue of aircraft material specimens.** A. Buch (Technion - Israel Institute of Technology, Haifa, Israel). *Materials Science and Engineering,* vol. 15, 1974, p. 75-85. 21 refs.

The work is based on the assumption of a size-independent critical thickness h of a surface material layer subjected to stresses exceeding some constant critical value, and is an extension of Peterson's theory. Some shortcomings of Neuber's, Peterson's and Stieler's one-parameter formulas for the fatigue notch factor are reported. A new two-parameter formula for this factor is derived and proved for internally notched aircraft sheet specimens with and without cladding in the cases of tension - compression and pulsating tension. (Author)

A75-15320 # Enhancement of wear resistance of aircraft parts (Povyshenie iznosostoikosti detalei samoletov). K. A. Krylov. Moscow, Izdatel'stvo Transport, 1974. 144 p. 99 refs. In Russian.

The present work examines the causes of insufficient wear resistance of the rubbing parts in the hinge and pin joints of aircraft undercarriages, the valves and piston pairs of hydraulic, oil, and fuel system assemblies, and the slotted parts of engines and other assemblies. Results of studies of the conditions for excessive wear in those parts are presented. The nature of fretting corrosion and its effect on the durability of aircraft parts is investigated. Recommendations are made for the reduction of various kinds of wear in aircraft parts. P.T.H.

A75-15401 An estimation of aerodynamic forces on wing-flap systems in a slipstream. M. Yonezawa (Kinki University, Osaka, Japan) and K. Matsuoka (Osaka Prefecture, University, Osaka, Japan). In: Theoretical and applied mechanics. Volume 22. (A75-15376 04-39) Tokyo, University of Tokyo Press, 1974, p. 503-512.

In this paper, equations to estimate the aerodynamic forces on propeller-wing-flap systems, such as deflected slipstream-type STOL aircraft are formulated. The momentum-deflection angles of the propeller slipstream are determined considering the mixing effect between the free stream and the propeller slipstream. The equations are given as a function of propeller thrust coefficient, useful for estimating the approximate coefficients of lift and longitudinal forces at any transitional flight speed. Wind-tunnel testing was also carried out with a model of the propeller-wing-flap configuration and the results are compared with those of the present theory. (Author)

A75-15404 An experimental study of the effects of upstream obstructions upon subsonic jet noise. K. K. Ahuja (Syracuse University, Syracuse, N.Y.). *Journal of Sound and Vibration,* vol. 37, Nov. 22, 1974, p. 205-234. 37 refs.

Results obtained for noise produced by two obstructions - one circular (1 inch diameter by 2.84 inch long) and another rectangular (0.4 inch thick by 1 inch wide by 2.84 inch long) in shape - immersed in both 'clean' and turbulent flows 4.8 inches upstream of the nozzle exit are described. Variations of overall sound pressure levels (OASPL's) and power watt levels with jet exit velocity and the directivities of OASPL's are considered in detail. Considerable care was taken to ensure that any comparison of the obstruction generated noise with the 'clean' jet noise is for the same mean jet exit velocity and thrust. The mean jet exit velocity was derived from the measured velocity profile at the nozzle exit in each case. (Author)

A75-15542 Effect of hole machining methods on resistance of aircraft constructional materials to fatigue failure. A. M. Rozenberg, O. A. Rozenberg, and V. I. Mal'nev (Akademiia Nauk Ukrainskoi SSR, Institut Sverkhtverdykh Materialov, Kiev, Ukrainian SSR). *(Problemy Prochnosti,* vol. 6, Feb. 1974, p. 109-111.) *Strength of Materials,* vol. 6, no. 2, Nov. 1974, p. 245-247. Translation.

A75-15561 Inflight fueling helps speed YF-17 test series. D. E. Fink. *Aviation Week and Space Technology,* vol. 101, Dec. 16, 1974, p. 40-46.

Inflight refueling was used in the flight test program of the YF-17 prototypes in order to increase flying time, especially when testing high performance maneuvers, and to reduce fuel expenditure, engine cycles, and brake and tire wear associated with takeoffs and landings. Performance testing was completed in ten days rather than the usual six weeks. Reliability was high in the aircraft systems, with a few notable failures in the engines and canopy. The YJ101 engines responded well to pilot throttle commands. The advantages of the YF-17 as an air combat fighter include high rates of climb and acceleration, superior high altitude and low-speed performance, and unlimited pilot visibility. Other advantages include a small frontal area and smokeless engines which begin to generate contrails at higher altitude than current engines. A.T.S.

A75-15562 F-15 manufacturing cost cuts pushed. C. A. Robinson. *Aviation Week and Space Technology,* vol. 101, Dec. 16, 1974, p. 49-51.

Production time and costs of the F-15 aircraft are held down through the reduction of detail assembly and the use of three- and five-axis machine tools operated under a computerized direct numerical control (DNC) method. Improvements in production results of the F-15 compared to the F-4 are discussed. The operation of the computerized machining method and reliability monitoring programs is explained. A.T.S.

A75-15567 Aircraft noise charges. A. Alexandre and J.-P. Barde. *Noise Control Engineering,* vol. 3, Sept.-Oct. 1974, p. 54-59. 6 refs.

A pollution charge is a tax proportional to the emissions of a polluting agent, be it a discharge of waste waters or noise emissions. Two different systems regarding the basis for the charge are analyzed. One system is based directly on the noise levels of aircraft. The other system makes use of an annoyance indicator of aircraft noise, i.e., some nonmonetary evaluation of the damage caused by noise. G.R.

A75-15569 Aircraft noise and prospects for its control. J. E. Ffowcs Williams (Cambridge University, Cambridge, England). *(Interagency Symposium on University Research in Transportation Noise, 2nd, Raleigh, N.C., June 5, 1974.) Noise Control Engineering,* vol. 3, Sept.-Oct. 1974, p. 82-87.

Possible approaches for reducing aircraft noise by making use of presently existing technology are considered. Problems are connected with the economic costs involved in retrofitting large, noisy aircraft with sound absorption kits and jet noise suppressors or in replacing the noisy aircraft with new quieter models. Commercial pressures exist, therefore, for achieving even better technology. Possibilities and approaches for doing this are discussed in some detail. G.R.

A75-15714 B-1 hydraulics - A guide to future system design. V. J. Austin (Rockwell International Corp., Los Angeles, Calif.). *Hydraulics and Pneumatics,* vol. 27, Dec. 1974, p. 51-53.

Four hydraulic systems are used for the supersonic B-1 strategic bomber. The design of the B-1 hydraulic systems makes it possible for the aircraft to complete a mission even if one hydraulic system is lost. A safe flight and landing can be achieved if two systems fail. The configuration of the systems is discussed along with operational details and questions of component design. G.R.

A75-15827 # Motion of an evaporating fuel droplet in the jet of a mechanical nozzle (O dvizhenii isparaiushcheisia kapli topliva v fakele mekhanicheskoi forsunki). S. V. Ananikov and A. V. Talantov. *Aviatsionnaia Tekhnika,* vol. 17, no. 3, 1974, p. 9-14. 9 refs. In Russian.

An analytical solution is obtained to the problem of the unsteady motion of an isolated evaporating fuel droplet in the spray field of a fuel nozzle. Expressions are derived for calculating the velocities and dwell time of the droplet in the unsteady portion of its motion and for calculating the path traversed by the droplet. A relation for determining the size of the droplet during the evaporation process is obtained. V.P.

A75-15828 # **Optimization of air-cooling systems for aircraft gas-turbine blades (K optimizatsii sistem vozdushnogo okhlazhdeniia lopatok aviatsionnykh gazovykh turbin).** E. N. Bogomolov. *Aviatsionnaia Tekhnika,* vol. 17, no. 3, 1974, p. 15-24. 7 refs. In Russian.

Analytical expressions are derived for calculating the relative drop in mean temperature of turbine blades due to internal air cooling, with allowance for the characteristics of the cooling system and of the cooling channels, for the gas parameters in the turbine, and for the flight conditions. The influence of preswirling the cooling air in front of the rotor is studied. Means of optimizing the system parameters are examined. V.P.

A75-15836 # **Experimental investigation of ejectors with a view toward the mechanization of wings with BLC (Eksperimental'noe issledovanie ezhektornykh ustroistv primenitel'no k mekhanizatsii kryla s UPS).** I. I. Kalmykov, N. N. Koval'nogov, and A. I. Matiazh. *Aviatsionnaia Tekhnika,* vol. 17, no. 3, 1974, p. 66-69. In Russian.

Test data obtained for an ejector with a curvilinear channel in the absense of external flow are studied. The influence of the geometrical and gasdynamic parameters on ejector performance is analyzed. The applicability of an ejector scheme to the control of boundary layers on flaps is evaluated. V.P.

A75-15890 **Limit cycles of a system satisfying a generalized Van der Pol equation.** A. W. Babister (Glasgow University, Glasgow, Scotland). In: Gyrodynamics; Proceedings of the Colloquium, Louvain-la-Neuve, Belgium, September 3-5, 1973. (A75-15876 04-12) Berlin, Springer-Verlag, 1974, p. 134-140. 6 refs.

The equations for the pitching motion of an aircraft are considered, taking into account the nonlinearity characteristics of the lift and pitching moment. It is found that under certain conditions the obtained system has a limit cycle which can be stable or unstable. The general nature of the system solutions is considered along with the phase plane trajectories for a basic case. G.R.

A75-15951 * # **Vorticity associated with a jet in a cross flow.** R. Fearn (Florida, University, Gainesville, Fla.) and R. P. Weston. *AIAA Journal,* vol. 12, Dec. 1974, p. 1666-1671. 9 refs. Grant No. NGL-10-005-127.

An extensive wind-tunnel test of a round turbulent jet directed normally through a flat plate into a subsonic cross flow has been conducted. The results of the velocity field measurements are presented in a concise and usable form through the use of simple models to relate the velocity field to empirical values for the strength and location of the pair of contrarotating vortices associated with the jet. (Author)

A75-15952 * # **Lifting-surface theory for a semi-infinite wing in oblique gust.** S. Chu (MIT, Cambridge, Mass.; NASA, Ames Research Center, Moffett Field, Calif.) and S. E. Widnall (MIT, Cambridge, Mass.). *AIAA Journal,* vol. 12, Dec. 1974, p. 1672-1678. 15 refs. Navy-supported research.

An unsteady lifting-surface theory is developed for the calculation of the airload on a semi-infinite-span thin wing in a compressible flow due to interaction with an oblique gust. By using the solutions obtained for a two-dimensional wing, the problem is formulated so that the unknown is taken to be the difference between the airload on the semi-infinite wing and that on a two-dimensional wing under the same gust conditions. Since this airload difference is nonzero only near the wing tip, the control points need be distributed in the tip region only; this significantly simplifies the numerical procedure. Results are presented for a wing with rectangular tip. The implication for noise and unsteady loads due to blade-vortex interaction for helicopter rotors is discussed. (Author)

A75-15957 # **Method for determining the effect of added stores on aeroelastic systems.** H. E. Fettis (Technology, Inc., Dayton, Ohio). *AIAA Journal,* vol. 12, Dec. 1974, p. 1733-1735.

A method for determining the effect of an added store on the stability of an aeroelastic system is described. A plot of the critical store mass vs the store inertia for a fixed flight velocity is obtained. The procedure involves a determinant evaluation and the solution of an algebraic equation with real coefficients. The possibility for investigating a wide range of store loadings and unbalances is achieved. T.S.

A75-15958 # **Integral approximation for slender-body shock shapes in hypersonic flow.** T. D. Fiorino (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio) and M. L. Rasmussen (Oklahoma, University, Norman, Okla.). *AIAA Journal,* vol. 12, Dec. 1974, p. 1735-1737. 8 refs.

The investigation reported is concerned with a method due to Chernyi (1961). Chernyi arrives at a pair of ordinary differential equations which describe the shock shapes and body pressure distribution associated with slender planar bodies and bodies of revolution. The investigation shows that the pair of equations reduces to a single quadrature for the body shape when the shock shape is known. G.R.

A75-15973 * # **Use of slotted walls to reduce wind-tunnel boundary corrections in subsonic flow.** A. G. Parker (Texas A & M University, College Station, Tex.). *AIAA Journal,* vol. 12, Dec. 1974, p. 1771, 1772. 9 refs. Contract No. NAS2-7917.

A75-16075 **Aircraft overhaul cleaning requirements and their effect on the fluorescent penetrant inspection process.** R. T. Fricker (U.S. Navy, Materials Engineering Laboratory, San Diego, Calif.). *(American Society for Nondestructive Testing, National Spring Conference, Los Angeles, Calif., Mar. 11-14, 1974.) Materials Evaluation,* vol. 32, Dec. 1974, p. 262, 263, 268.

The paper discusses an approach of preparing aircraft components for inspection. It is necessary that quality control start at the first cleaning process and continue throughout to provide adequate precleaning. Before proceeding to the next process proper quality control will stop and preclean parts with certain defects such as corrosion and residual paint. It is indicated that fluorescent penetrant is needed to provide economical and reliable inspection of properly precleaned and processed items. T.S.

A75-16126 **Gasdynamics of engines for flight vehicles (Gazodinamika dvigatelei letatel'nykh apparatov).** Edited by B. S. Vinogradov. Kazan, Kazanskii Aviatsionnyi Institut (KAI, Trudy, Seriia Aviatsionnye Dvigateli, No. 156), 1973. 66 p. In Russian.

Selected aspects of the design of gas turbine engines and fluidic elements are examined in a number of papers. Some of the topics covered include: a method for calculating the three-dimensional flow in the interblade channels of axial turbomachines, selection of parameters for jet engine reversing devices, calculation of twin two-dimensional jets in cross flow, methods for frequency stabilization of fluidic oscillators, and study of the mixing of a fan jet with a gas flow. P.T.H.

A75-16128 # **Choice of geometric parameters for some schemes of jet engine reversing devices (Vybor geometricheskikh parametrov nekotorykh skhem reversiruiushchikh ustroistv TRD).** E. D. Nesterov. In: Gasdynamics of engines for flight vehicles. Kazan, Kazanskii Aviatsionnyi Institut, 1973, p. 9-16. In Russian.

The geometric parameters of two reversing devices are investigated with respect to criteria for obtaining reversal without flow separation in the channel. Analytical results for predicting thrust reversal coefficient for given geometric parameters are compared with experiment. P.T.H.

A75-16221 **Aerospace sandwich materials. II (Matériaux sandwich aérospatiaux. II).** S. Dzalba-Lyndis (Société Nationale Industrielle Aérospatiale, Paris, France). *Matériaux et Techniques,* vol. 62, Oct. 1974, p. 405-415. In French.

Description, procedures of manufacture, and operation and particular characteristics of some sandwich materials of current use. Numerous products are available both in Europe and the U.S., and particular interest is taken in the NIDA product. NIDA is a material for sandwich structures of the honeycomb type. Composition, production, mechanical properties, technology and quality control of the material are discussed in detail. The application of some sandwich materials to the Concorde aircraft is mentioned. F.R.L.

A75-16257 **Methods of estimating the wing buffeting characteristics of aircraft.** K. Ueyama, T. Shibata, M. Kodama, and T. Hanai. *Mitsubishi Juko Giho,* vol. 11, no. 5, 1974, p. 114-123. 29 refs. In Japanese, with abstract in English.

The wing buffeting of aircraft due to flow separation caused by the interaction of the boundary layer and a shock wave on the wing surface at a high subsonic speed is a great nuisance to the crews and passengers. The authors describe the flow field on the wing surface at a high subsonic region, and define the statistical properties of the buffet load and the normal acceleration of the buffet onset in flight. Some new methods of estimating the buffet boundary and intensity are described. (Author)

A75-16263 **Certain forms of stability of twin-blade semirigid rotors (Su alcune forme di instabilità dei rotori semirigidi bipala).** M. Borri and P. Mantegazza (Milano, Politecnico, Milan, Italy). *(Associazione Italiana di Aeronautica e Astronautica, Congresso, 2nd, Pisa, Italy, Sept. 24-28, 1973.) L'Aerotecnica - Missili e Spazio,* vol. 53, Oct. 1974, p. 313-322. 12 refs. In Italian.

Analysis of certain forms of mechanical instability typical of a twin-blade semirigid rotor with an elastic suspension. Using a simplified scheme, the existence of typical forms of static and dynamic instability in such a system is revealed, as well as the possibility of constant-force resonance with respect to a fixed reference system. It is shown how the effect of damping on a completely isotropic suspension system may considerably modify the stability limit curves, leading to the complete disappearance of unstable zones. In the case of anisotropic suspension there again exist instability zones strongly influenced by damping, but in this case it is found that a parametric study of the phenomenon is not suitable, so that the analysis is therefore limited to certain cases pertaining to particular values of the parameters for which the Floquet transfer matrix technique is employed. A.B.K.

A75-16266 **Experimental analysis of wing boxes subjected to heating (Analisi sperimentale in cassoni alari soggetti a riscaldamento).** G. Panichi, R. Barboni, and P. Santini (Roma, Università, Rome, Italy). *L'Aerotecnica - Missili e Spazio,* vol. 53, Oct. 1974, p. 341-346. 9 refs. In Italian. Consiglio Nazionale delle Ricerche Contract No. 70,02104,07,115,481.

Experimental study of the elastic and inelastic behavior of artificially aged anticorodal model wing boxes subjected to heating. An attempt is made to obtain an approximate estimate of the effect of temperature on the basis of simplifying assumptions concerning the behavior of the structure. For this purpose, the results obtained using Bredt's theory are compared with those obtained on the basis of Santini's four-flange schematization and the Vlasov theory. Following this, the effect of prolonged heating on the deformations of a wing box subjected to a constant torsional load is considered, and an estimate is made of the effects of viscous creep in the case of torsion. Finally, estimates are made of the coefficients which make it possible to give an analytic description of the phenomenon in wider temperature and load ranges than those actually tested. A.B.K.

A75-16421 # **Characteristic of a powered glider during circling (Charakterystyka motoszybowca w krazeniu).** W. Stafiej (Osrodek Badawczo-Rozwojowy Szybownictwa, Bielsko-Biala, Poland). *Technika Lotnicza i Astronautyczna,* vol. 29, Nov. 1974, p. 16-18, 36. In Polish.

The circling characteristics of a glider are analyzed for powered and unpowered flight. Use is made of the parameters of the Ogar glider, a two-seater having a high wing of trapezoidal shape and Wortmann profile, with a lifting surface of 19 sq m and an aspect ratio of 16. V.P.

A75-16422 # **Principles for selecting the process of overhauling jet-engine compressor and turbine blades (Zasady wyboru procesu renowacji lopatek sprezarek i turbin silnikow odrzutowych).** M. Marciniak (Warszawa, Politechnika, Warsaw, Poland). *Technika Lotnicza i Astronautyczna,* vol. 29, Nov. 1974, p. 25-29, 36. 5 refs. In Polish.

Based on a discussion of the operations involved in the production of compressor and turbine blades, it is suggested that grinding and polishing may be replaced by mechanical vibrational abrasion and by a strengthening vibrational shot peening technique. Guidelines for selecting the proper technique for specific types of blade damage are developed. V.P.

A75-16423 # **Airports in the modern world. III (Porty lotnicze w nowoczesnym swiecie. III).** J. Smolenski. *Technika Lotnicza i Astronautyczna,* vol. 29, Nov. 1974, p. 30-33. In Polish.

The principles of planning the capacity of an airport on the basis of the expected traffic are examined, along with the planning of access roads to meet the expected requirements. The specific features of specialized airports are discussed. The important role of an airport as a factor of suburban and rural economic development is noted, and the difficulties and complex problems arising in the selection of the airport site are emphasized. V.P.

A75-16489 * **Airborne laser Doppler velocimeter.** R. M. Munoz (NASA, Ames Research Center, Moffett Field, Calif.), H. W. Mocker, and L. Koehler (Honeywell Systems and Research Center, Minneapolis, Minn.). *Applied Optics,* vol. 13, Dec. 1974, p. 2890-2898. 16 refs.

A CO2 laser Doppler detection system has been developed to measure remotely the true airspeed of an aircraft. The system uses a 50-W sealed-off CO2 laser in a homodyne detection system employing a collinear optical telescope, a HgCdTe detector, and a frequency tracking loop. The system was successfully flight-tested on a NASA Convair 990 research aircraft during December 1971 and June 1972. The results indicate that an airspeed measurement under clear weather conditions is feasible up to an altitude of 3000 m with an error of less than 0.5%. (Author)

A75-16608 * **The NASA Ames integral aircraft passenger seat concept - A human engineering approach.** C. C. Kubokawa

(NASA, Ames Research Center, Moffett Field, Calif.). *SAFE Journal,* vol. 4, Winter 1974, p. 18-23. 33 refs.

A new NASA Ames concept for an aircraft passenger seat has been under research and development since 1968. It includes many human-factor features that will provide protection to the passenger from vibration, jostle, and high impact. It is comfortable and safer than any of the seats presently in use. An in-depth design, fabrication, and impact analysis was conducted in order to design a seat that will maximize passenger protection in high g impacts (20 g horizontal -Gx, 36 g vertical +Gz, 16 g lateral Gy). The method for absorbing impact energy was accomplished with a combination of stretching stainless steel cables, thread breaking of stitches, hydraulic mechanism and the special Temper Form cushions. The restraint system for the seat consisted of a lap belt and shoulder harness inertia reel combination. (Author)

A75-16621 # **New engine cycles - Opportunity for creativity.** W. C. Swan and G. J. Schott (Boeing Commercial Airplane Co., Seattle, Wash.). *Astronautics and Aeronautics,* vol. 13, Jan. 1975, p. 24-35.

The use of variable-cycle engines is a promising solution to problems in multimission aircraft design. Two concepts, the SST and the STOL are treated as multimission aircraft to show possible advantages in their use of variable-cycle engine systems, including consideration of intake and exhaust configurations. The Boeing 2707-300 SST was to have both subsonic and supersonic cruise capabilities. It is shown that the use of variable-cycle engines could significantly reduce the weight of such a design. In STOL craft, variable-cycle engines could help solve weight, efficiency, performance, and noise problems. Energy conservation in future transport engines is considered, and the design of regenerators for reducing fuel consumption is discussed. The need for close cooperation between airframe and engine manufacturers in future applications of variable-cycle engines is emphasized. A.T.S.

A75-16625 * **Consideration of materials for aircraft brakes.** M. B. Peterson and T.-L. Ho (Rensselaer Polytechnic Institute, Troy, N.Y.). *Lubrication Engineering,* vol. 30, Dec. 1974, p. 590-595. Grant No. NGR-33-018-152.

A study has been made of the frictional behavior of several aircraft brake materials using a simple high-temperature Falex-type apparatus. Tests were run at velocities of seven ft/minute; loads to 600 pounds and temperatures to 700 C. The data for these brake materials sliding against a variety of steels and other materials indicate a large reduction in friction due to surface oxidation in the temperature range 250 to 300 C. It also was found that the retention of this oxide was a function of the temperature changes. With increasing temperature the oxide was removed, while with reducing temperature it was retained. Frictional behavior was more characteristic of the steel than the brake material. (Author)

STAR ENTRIES

N75-11893*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EFFECTS OF LEADING EDGE SWEEP ANGLE AND DESIGN LIFT COEFFICIENT ON PERFORMANCE OF A MODIFIED ARROW WING AT A DESIGN MACH NUMBER OF 2.6
Robert J. Mack Washington Dec. 1974 51 p refs
(NASA-TN-D-7753; L-9446) Avail: NTIS HC $4.25 CSCL 01B

Wing models were tested in the high-speed section of the Langley Unitary Plan wind tunnel to study the effects of the leading-edge sweep angle and the design lift coefficient on aerodynamic performance and efficiency. The models had leading-edge sweep angles of 69.44 deg, 72.65 deg, and 75.96 deg which correspond to values of the design Mach-number-sweep-angle parameter (beta cotangent A) sub DES of 0.6, 0.75, and 0.9, respectively. For each sweep angle, camber surfaces having design lift coefficients of 0.0.08, and 0.12 at a design Mach number of 2.6 were generated. The wind-tunnel tests were conducted at Mach numbers of 2.3, 2.6, and 2.96 with a stagnation temperature of 338.7 K (150 F) and a Reynolds number per meter of 9.843 times 10 to the 6th power. The results of the tests showed that only a moderate sweeping of the wing leading edge aft of the Mach line along with a small-to-moderate amount of camber and twist was needed to significantly improve the zero-lift (flat camber surface) wing performance and efficiency. Author

N75-11896*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A WIND TUNNEL INVESTIGATION OF THE WAKE NEAR THE TRAILING EDGE OF A DEFLECTED EXTERNALLY BLOWN FLAP
William G. Johnson, Jr. and Gerald E. Kardas Washington Oct. 1974 190 p refs
(NASA-TM-X-3079; L-9665) Avail: NTIS HC $7.00 CSCL 01A

The model tested was a general research model of a swept-wing, jet-powered STOL transport with externally blown flaps. The model was tested with four engine simulators mounted on pylons under the wing. Tests were conducted in the V/STOL tunnel over an angle of attack range of 0 deg to 16 deg and a thrust coefficient range from 0 to approximately 4 at a Reynolds number of 0.461 x 1 million based on the wing reference chord. The results of this investigation are presented primarily as plots of the individual velocity vectors obtained from the wake survey. These data are used to extend an earlier analysis to isolate the effects of the engine thrust on the behavior of the flow at the flap trailing edge. Results of a comparison with a jet-flap theory are also shown. Author

N75-11898*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AERODYNAMIC ROLL DAMPING OF A T-TAIL TRANSPORT CONFIGURATION
Richard P. Boyden Washington Dec. 1974 31 p refs
(NASA-TM-X-3115; L-9378) Avail: NTIS HC $3.75 CSCL 01B

The aerodynamic roll damping and the yawing moment due to roll rate for a model of a T-tail transport with aft-mounted engines were measured by means of a small-amplitude forced-oscillation mechanism. The tests were made for Mach numbers between 0.21 and 0.80 over a range of angles of attack from about minus 4 deg to 22 deg. The basic configuration had positive damping in roll at low angles of attack with regions of low positive and negative damping for angles of attack above 8 deg to 10 deg. There was good agreement between the theoretical estimates of the roll damping for the wing alone and the experimental results at an angle of attack of 0 deg for Mach numbers of 0.60 and less. The T-tail configuration and the engine nacelles mounted aft on the fuselage did not significantly affect either the damping in roll or the yawing moment due to roll rate. Author

N75-11901# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
APPLICATION OF THE NONLINEAR THEORY OF A LISTING SURFACE TO THE CALCULATION OF AERODYNAMIC CHARACTERISTICS OF A TRIANGULAR WING MOVING CLOSE TO THE EARTH'S SURFACE
S. D. Ermolenko, Yu. A. Rogozin, and G. V. Rogachev 26 Aug. 1974 22 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Sibirskoe otd., Ser. Tekhn. Nauk (USSR), no. 8, 1969 p 14-26
(AD-785154; FTD-HC-23-1802-74) Avail: NTIS CSCL 01/1

A solution of the problem under consideration for triangular wings is proposed by means of the nonlinear theory of a lifting surface, making it possible to consider nonlinear effects determined both by the influence of the wing tips and also by the proximity of the surface of the earth. GRA

N75-11903# Kaman Aerospace Corp., Bloomfield, Conn.
ANALYSIS OF UNMANNED, TETHERED, ROTARY-WIND PLATFORMS Final Technical Report, Aug. 1973 - Apr. 1974
Lawrence H. McNeill, Arvid Plaks, and William E. Blackburn Jul. 1974 181 p refs
(Contract DAAJ02-74-C-0008)
(AD-785581; R-1259; USAAMRDL-TR-74-56) Avail: NTIS CSCL 01/3

A study was conducted; (1) to determine the feasibility of an unmanned, tethered, rotary-wing vehicle as an elevated platform for target detection sensors or other payloads, and (2) to determine the best approach to implementing specified design and performance requirements. A review was made of current and past developments of tethered platforms, and a large number of rotary-wing lift concepts, rotor drive and long-endurance power concepts, and stabilization and control concepts were formulated for evaluation. Mathematical models were designed and a digital computer was used to generate quantitative data on air vehicle size, weight, horsepower, etc., for alternative systems. A turboshaft-driven synchropter, utilizing fuel pumped from the ground for long endurance, was recommended as the best overall approach for an unmanned tethered platform. The synchropter, with cyclic pitch controls, will provide a stable platform for mission sensors and can be operated, without attention from the ground, by a simple automatic flight control system. (Modified author abstract) GRA

N75-11906# Army Aviation Systems Command, St. Louis, Mo.
MAJOR ITEM SPECIAL STUDY (MISS), CH-54A ROTARY WING BLADE Interim Report, 1 Jan. 1964 - 30 Jun. 1973
Aug. 1974 22 p
(AD-785554; USAAVSCOM-TR-74-39) Avail: NTIS CSCL 01/3

Major Item Special Study (MISS) reports are performed on DA Form 2410 reportable components. These are time change items and certain condition change items selected because of high cost or need for intensive management. Basically, the MISS reports are concerned with analyzing reported removal data presented in the Major Item Removal Frequency (MIRF) report. The failure modes reported for each removal are examined and grouped into categories which are intended to clarify the intent of the data reporting. From this data, removal distribution can be plotted and an MTR (mean time to removal) can be calculated. The MISS reports then investigate possible cost savings based on total elimination of selected failure modes. These modes are chosen because of the percentage of failures they represent and/or because they appear to be feasible Product Improvement Program (PIP) areas. Author (GRA)

N75-11910*# Douglas Aircraft Co., Inc., Long Beach, Calif.
PARAMETRIC STUDY OF STOL SHORT-HAUL ENGINE CYCLES AND OPERATIONAL TECHNIQUES TO MINIMIZE COMMUNITY NOISE IMPACT Final Report
Washington NASA Nov. 1974 89 p refs
(Contract NAS2-6994)
(NASA-CR-2486) Avail: NTIS HC $4.75 CSCL 01B

The effect of aircraft operational techniques in the terminal area on community noise impact of future short-haul aircraft was investigated. These operational techniques affected altitude, flap retraction rate, thrust cutback altitude, amount of thrust cutback, and amount of turning. During landing the parameters varied were glide slope angle, change in slope angle (two segment approach), and flap extension rate. One mechanical-flap (MF) aircraft and one externally-blown-flap (EBF) aircraft were used to study by noise impact at four U.S. airports, Hanscom Field (Boston); Washington National; Midway (Chicago); and Orange County (California). With the exception of Washington National (DCA), the study showed that a reduction of approximately 40 percent in the number of people highly annoyed (as defined in the study) can be obtained by using these operational techniques. At DCA the number of people highly annoyed using the standard procedure was quite low, but it is significant that the minimum-impact case for Runway 36 reduced the number of people highly annoyed to zero using a power cutback and a turning departure path. The evaluation procedures and methodology developed in this study represents an advance in acoustical state-of-the-art and should provide an effective and useful tool for determining aircraft noise impact upon the airport community. Author

N75-11914# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
DEPOT REQUIREMENTS FOR BASE LEVEL DATA ON AIRCRAFT INERTIAL PLATFORMS M.S. Thesis
Wilfred H. Plunkett and Richard N. Moore Aug. 1974 142 p refs
(AD-785443; SLSR-2-74B) Avail: NTIS CSCL 17/7

Some of the most expensive aircraft components to maintain are stabilized platforms used in aircraft inertial systems. In the majority of USAF aircraft equipped with an inertial system, the inertial platform ranges from the second to the eighth most expensive component to maintain. For most of these aircraft, depot level maintenance constitutes from 55 to 90% of the total inertial platform support costs. Several recent programs to improve reliability and reduce support costs of aircraft inertial systems have been hampered by the quality and type of base level performance and maintenance data available to the Aerospace Guidance and Metrology Center (AGMC), USAF's inertial platform central repair depot. This study was an attempt to determine AGMC's specific requirements for base level data. (Modified author abstract) GRA

N75-11923# Mitre Corp., McLean, Va.
AN ADVANCED AIR TRAFFIC MANAGEMENT CONCEPT BASED ON EXTENSIONS OF THE UPGRADED THIRD GENERATION ATC SYSTEM. SYSTEM B: ATC AUTOMATION ANALYSIS
A. N. Sinha Feb. 1974 65 p refs
(Contract DOT-FA70WA-2448)
(AD-785312; MTR-6419-Ser-7; FAA-EM-73-10A-Ser-7) Avail: NTIS CSCL 17/7

The AATMS study was initiated in an effort to evaluate various concepts of fourth generation air traffic control in the 1995 era. This report discusses the ATC automation requirements of the control center configurations of an upgraded third generation ATC system. Computer sizing estimates are presented for all the control centers in the System B 1995 configuration. Cost estimates, in current dollars, for the computer systems, based on existing technology, are also presented. GRA

N75-11924# Mitre Corp., McLean, Va.
AN ADVANCED AIR TRAFFIC MANAGEMENT CONCEPT BASED ON EXTENSIONS OF THE UPGRADED THIRD GENERATION ATC SYSTEM. SYSTEM B: SYSTEM COST ANALYSIS
A. N. Sinha Sep. 1973 64 p refs
(Contract DOT-FA70WA-2448)
(AD-785313; MTR-6419-Ser-8; FAA-EM-73-10A-Ser-8) Avail: NTIS CSCL 17/7

The AATMS study was initiated to evaluate various concepts of fourth generation air traffic control in the 1995 era. The purpose was to aid in the long-range planning of research and development, and to identify areas that appear the most promising for early preparation for the fourth generation. The report discusses the system cost analysis of an extension of the upgraded third generation ATC system. Cost estimates are presented for the surveillance, communications, and navigation subsystems as well as for the control centers and controller staffing. GRA

N75-11925# Mitre Corp., McLean, Va.
AN ADVANCED AIR TRAFFIC MANAGEMENT CONCEPT BASED ON EXTENSIONS OF THE UPGRADED THIRD GENERATION ATC SYSTEM. SYSTEM B: DISCRETE ADDRESS BEACON SYSTEM (DABS) ACCURACY AND COVERAGE REQUIREMENTS
V. P. Gupta and A. Haines Feb. 1974 63 p refs
(Contract DOT-FA70WA-2248)
(AD-785311; MTR-6419-Ser-5; FAA-EM-73-10A-Ser-5) Avail: NTIS CSCL 17/7

The report develops the DABS system configuration for the Advanced Air Traffic Management System (AATMS), System B, and evaluates the coverage provided by the resulting 291 DABS sites. More than 90% of the CONUS is found to be covered down to 3,000: AGL under a four-thirds earth assumption. The report also develops the IFR spacing standards and the navigation and surveillance requirements sufficient for AATMS, System B, to handle the projected 1995 nominal demand load. Two worst cases have been chosen, the New York to Chicago corridor for the en route case, and the Los Angeles Basin for the terminal case. GRA

N75-11926# Mitre Corp., McLean, Va.
AN ADVANCED AIR TRAFFIC MANAGEMENT CONCEPT BASED ON EXTENSIONS OF THE UPGRADED THIRD GENERATION ATC SYSTEM. SYSTEM B: 1995 LOS ANGELES BASIN TRAFFIC MODEL, VOLUME 1
A. D. Mundra Mar. 1974 90 p refs
(Contract DOT-FA70WA-2448)
(AD-785309; MTR-6419-Ser-4-Vol-1;
FAA-EM-73-10A-Ser-4-Vol-1) Avail: NTIS CSCL 17/7

A model of air traffic in the Los Angeles basin for the 1995 time frame is developed in this document. Details of annual operations demand projections for the basin including a distribution of loads over airports are provided. This demand is then translated into a typical peak instant traffic picture (snapshot of the airspace) and estimates of the busy hub hour loads for airports. The snapshot is summarized for various characteristics such as user type, flight type, altitude distributions and speed distributions. GRA

N75-11927# Mitre Corp., McLean, Va.
AN ADVANCED AIR TRAFFIC MANAGEMENT CONCEPT BASED ON EXTENSIONS OF THE UPGRADED THIRD GENERATION ATC SYSTEM. SYSTEM B: 1995 LOS ANGELES BASIN TRAFFIC MODEL, VOLUME 2
A. D. Mundra Mar. 1974 128 p
(Contract DOT-FA70WA-2448)
(AD-785310; MTR-6419-Ser-4-Vol-2; FAA-EM-73-10A-Ser-4-Vol-2) Avail: NTIS CSCL 17/7

The volume contains the complete set of arrival/departure matrices and its supporting data, used for the generation of the snapshot of Los Angeles 1995 airspace (Appendix B). This snapshot is listed in its entirety (Appendix C). Also included are summary statistics on the snapshot in the form of density maps of the basin by altitude bands and detailed altitude and speed statistics for important flight categories (Appendix D). GRA

N75-11928# Mitre Corp., McLean, Va.
AN ADVANCED AIR TRAFFIC MANAGEMENT CONCEPT BASED ON EXTENSIONS OF THE UPGRADED THIRD GENERATION ATC SYSTEM. SYSTEM B: AIR TRAFFIC ACTIVITY PROJECTIONS FOR 1995
D. Goldman Mar. 1974 89 p
(Contract DOT-FA70WA-2448)
(AD-785308; MTR-6419-Ser-3; FAA-EM-73-10A-Ser-3) Avail: NTIS CSCL 17/7

The report describes a set of projected 1995 air traffic activity data for use in evaluation of advanced air traffic management system concepts. Included in the projections are the aircraft fleets and operations rates for the air carrier, general aviation and military markets. Airport activity rates are estimated on an annual basis and instantaneous airborne counts are developed for a typical peak period. GRA

N75-11929*# Michigan Univ., Ann Arbor.
FRICTION AND TEMPERATURE RISE IN AIRCRAFT TIRES
S. K. Clark and R. J. Staples Mar. 1974 78 p refs
(Grant NGR-23-005-417)
(NASA-CR-134666; DRDA-036390-3-F) Avail: NTIS HC $4.75 CSCL 11J

The role of runway thermal conductivity in extending the operating range of pneumatic rubber aircraft tires in investigated. Measurements are made to determine the location of heat generation in the rolling tire and the contact resistance between the tire and the roadway. The approximate heat transfer characteristics between tire and runway are estimated for evaluating improvements in life and behavior of a skidding tire due to runway cooling. Author

N75-11930*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
NUMERICAL METHODS FOR THE DESIGN AND ANALYSIS OF WINGS AT SUPERSONIC SPEEDS
Harry W. Carlson and David S. Miller Washington Dec. 1974 76 p refs
(NASA-TN-D-7713; L-9542) Avail: NTIS HC $4.75 CSCL 01B

Numerical methods for the design and analysis of arbitrary-planform wings at supersonic speeds are reviewed. Certain deficiencies are revealed, particularly in application to wings with slightly subsonic leading edges. Recently devised numerical techniques which overcome the major part of these deficiencies are presented. The original development as well as the more recent revisions are subjected to a thorough review. Author

N75-11931*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A WIND-TUNNEL INVESTIGATION OF PARAMETERS AFFECTING HELICOPTER DIRECTIONAL CONTROL AT LOW SPEEDS IN GROUND EFFECT
William T. Yeager, Jr., Warren H. Young, Jr., and Wayne R. Mantay Washington Nov. 1974 176 p refs
(NASA-TN-D-7694; L-9325) Avail: NTIS HC $7.00 CSCL 01B

An investigation was conducted in the Langley full-scale tunnel to measure the performance of several helicopter tail-rotor/fin configurations with regard to directional control problems encountered at low speeds in ground effect. Tests were conducted at wind azimuths of 0 deg to 360 deg in increments of 30 deg and 60 deg and at wind speeds from 0 to 35 knots. The results indicate that at certain combinations of wind speed and wind azimuth, large increases in adverse fin force require correspondingly large increases in the tail-rotor thrust, collective pitch, and power required to maintain yaw trim. Changing the tail-rotor direction of rotation to top blade aft for either a pusher tail rotor (tail-rotor wake blowing away from fin) or a tractor tail rotor (tail-rotor wake blowing against fin) will alleviate this problem. For a pusher tail rotor at 180 deg wind azimuth, increases in the fin/tail-rotor gap were not found to have any significant influence on the overall vehicle directional control capability. Changing the tail rotor to a higher position was found to improve tail-rotor performance for a fin-off configuration at a wind azimuth of 180 deg. A V-tail configuration with a pusher tail rotor with top blade aft direction of rotation was found to be the best configuration with reqard to overall directional control capability. Author

N75-11932*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SUBSONIC WIND TUNNEL INVESTIGATION OF A TWIN-ENGINE ATTACK AIRPLANE MODEL HAVING NONMETRIC POWERED NACELLES
Vernard E. Lockwood and Aniello Matarazzo (Fairchild Republic Co.) Washington Nov. 1974 135 p refs
(NASA-TN-D-7742; L-9569) Avail: NTIS HC $5.75 CSCL 01B

A 1/10-scale powered model of a twin-engine attack airplane was investigated in the Langley high-speed 7- by 10-foot tunnel. The study was made at several Mach numbers between 0.225 and 0.75 which correspond to Reynolds numbers, based on the mean aerodynamic chord, of 1.35 million and 3.34 million. Unheated compressed air was used for jet simulation in the nonmetric engine nacelles which were located ahead of and above the horizontal stabilizer. Author

N75-11933*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A MOTION-CONSTRAINT LOGIC FOR MOVING-BASE SIMULATORS BASED ON VARIABLE FILTER PARAMETERS
G. Kimball Miller, Jr. Washington Dec. 1974 55 p refs
(NASA-TN-D-7777; L-9585) Avail: NTIS HC $4.25 CSCL 01B

A motion-constraint logic for moving-base simulators has been developed that is a modification to the linear second-order filters generally employed in conventional constraints. In the modified constraint logic, the filter parameters are not constant but vary with the instantaneous motion-base position to increase the constraint as the system approaches the positional limits. With the modified constraint logic, accelerations larger than originally expected are limited while conventional linear filters would result in automatic shutdown of the motion base. In addition, the modified washout logic has frequency-response characteristics that are an improvement over conventional linear filters with braking for low-frequency pilot inputs. During simulated landing approaches of an externally blown flap short take-off and landing (STOL) transport using decoupled longitudinal controls, the pilots were unable to detect much difference between the modified constraint logic and the logic based on linear filters with braking. Author

N75-11934# Research Inst. of National Defence, Stockholm (Sweden).
INFORMATION ON ATTACK HELICOPTERS: A COMPARISON [SAMMANSTAELLING AV UPPGIFTER OM ATTACKHELIKOPTRAR]
Curt Haglund Feb. 1973 58 p In SWEDISH
(FOA-2-C-2597-F8) Avail: NTIS HC $4.25

The experience from the war in Vietnam and simulated trials show that the attack helicopter equipped with anti-tank rockets, is a very effective weapon against tanks because it avoids enemy anti-aircraft fire provided suitable tactics are employed. The report mentions some war experiences and the extensive tests which have been carried out and also describes types of attack helicopters and weapon systems for them. In conclusion, a brief reference is made to the next generation of attack helicopters in the U.S.A. Author

N75-11935*# Rockwell International Corp., Los Angeles, Calif. Aircraft Div.
THEORETICAL PREDICTION OF THICK WING AND PYLON-FUSELAGE-FANPOD-NACELLE AERODYNAMIC CHARACTERISTICS AT SUBCRITICAL SPEEDS. PART 1: THEORY AND RESULTS
J. R. Tulinius 24 Jul. 1974 248 p refs
(Contract NAS2-7904)
(NASA-CR-137578) Avail: NTIS HC $7.50 CSCL 01C

The theoretical development and the comparison of results with data of a thick wing and pylon-fuselage-fanpod-nacelle analysis are presented. The analysis utilizes potential flow theory to compute the surface velocities and pressures, section lift and center of pressure, and the total configuration lift, moment, and vortex drag. The skin friction drag is also estimated in the analysis. The perturbation velocities induced by the wing and pylon, fuselage and fanpod, and nacelle are represented by source and vortex lattices, quadrilateral vortices, and source frustums, respectively. The strengths of these singularities are solved for simultaneously including all interference effects. The wing and pylon planforms, twists, cambers, and thickness distributions, and the fuselage and fanpod geometries can be arbitrary in shape, provided the surface gradients are smooth. The flow through nacelle is assumed to be axisymmetric. An axisymmetric center engine hub can also be included. The pylon and nacelle can be attached to the wing, fuselage, or fanpod. Author

N75-11936*# Rockwell International Corp., Los Angeles, Calif. Aircraft Div.
THEORETICAL PREDICTION OF THICK WING AND PYLON-FUSELAGE-FANPOD-NACELLE AERODYNAMIC CHARACTERISTICS AT SUBCRITICAL SPEEDS. PART 2: COMPUTER PROGRAM DESCRIPTION
J. Kojima and J. R. Tulinius 24 Jul. 1974 340 p
(Contract NAS2-7904)
(NASA-CR-137579) Avail: NTIS HC $9.50 CSCL 01C

The procedures required to operate the thick wing and pylon-fuselage-fanpod-nacelle computer program are presented. The program computes surface velocities and pressure, section loads, and total configuration loads and pitching moment. Potential flow theory is used to compute the surface pressures and the associated lift, moment, and vortex drag. The skin friction drag is also computed. Author

N75-11937*# Lockheed-Georgia Co., Marietta.
PROGRAM FOR ESTABLISHING LONG-TIME FLIGHT SERVICE PERFORMANCE OF COMPOSITE MATERIALS IN THE CENTER WING STRUCTURE OF C-130 AIRCRAFT. PHASE 3: FABRICATION Final Technical Report, Feb. 1973 - Jun. 1974
W. E. Harvill and A. O. Kays Sep. 1974 118 p refs
(Contract NAS1-11100)
(NASA-CR-132495; LG74ER0145) Avail: NTIS HC $5.25 CSCL 01C

The manufacturing plan for three C-130 aircraft center wing box test articles, selectively reinforced with boron-epoxy composites, is outlined for the following tasks: (1) tooling; (2) metal parts fabrication: (3) reinforcing laminate fabrication; (4) laminate-to-metal parts bonding; and (5) wing box assembly. The criteria used for reliability and quality assurance are discussed, and several solutions to specific manufacturing problems encountered during fabrication are given. A.A.D.

N75-11938# Technische Hochschule, Aachen (West Germany). Inst. fuer Luft- und Raumfahrt.
SHORT COURSE ON STOL AIRCRAFT TECHNOLOGY AND THE COMMUNITY, VOLUME 1
1974 470 p refs Partly in GERMAN; partly in ENGLISH
Conf. held at Aachen, 18-22 Mar. 1974 and Tullahoma, Tenn., 22-26 Apr. 1974 Prepared jointly with Univ. of Tenn. Space Inst.
Avail: NTIS HC $11.50

Topics in the field of short takeoff aircraft and their significance to the community are presented. A survey of STOL aircraft systems is given, and the design criteria are discussed. Some typical STOL projects are detailed. Problems related to high lift devices are surveyed. Special attention is given to noise problems. Comparisons with conventional means of short haul transportation are made.

N75-11939 Vereinigte Flugtechnische Werke-Fokker G.m.b.H., Bremen (West Germany).
VERTICAL AND SHORT TAKE-OFF DEMONSTRATED BY THE VAK 191 B
Rolf Riccius *In* Tech. Hochschule Aachen Short Course on STOL Aircraft Technol. and the Community, Vol. 1 1974 87 p refs

The concepts of jet supported STOL or V/STOL are considered, and design problems and handling qualities are discussed with a view to creating a better understanding between conventional STOL and jet-borne STOL and V/STOL aircraft. The design methods and test results of the VAK 191 B experimental aircraft are used as a reference to discuss some of the problem areas and highlight the handling qualities of this aircraft. ESRO

N75-11940 Lockheed-Georgia Co., Marietta.
STOL AIRCRAFT DESIGN APPROACHES: NOISE CONSIDERATIONS AND PERFORMANCE TRADEOFFS
Harold S. Sweet *In* Tech. Hochschule Aachen Short Course on STOL Aircraft Technol. and the Community, Vol. 1 1974 64 p

A number of different lift concepts for STOL aircraft were evaluated to considerable depth. These are discussed from the standpoint of the following evaluation parameters: fuel consumption, direct operating cost, return of investment, versatility, and flexibility. The lift concepts evaluated are: externally blown flap, augmentor wing, over-the-wing blowing systems, blowing boundary layer control, internally blown flap, and mechanical flap with and without vectored thrust. Noise levels were compared for the different concepts. ESRO

N75-11941 Messerschmitt-Boelkow-Blohm G.m.b.H., Hamburg (West Germany).
EUROPLANE QTOL: A EUROPEAN PROJECT PROPOSAL
Heribert Flosdorff *In* Tech. Hochschule Aachen Short Course on STOL Aircraft Technol. and the Community, Vol. 1 1974 45 p

A design philosophy for an aircraft capable of utilizing the existing infrastructure of airfields and air traffic control systems is presented. A considerable reduction in noise levels is expected and sufficient flexibility provided for adaption to future changes in operating procedures, and traffic control and guidance control systems. Design criteria are detailed, and performance characteristics presented graphically. ESRO

N75-11942 Messerschmitt-Boelkow-Blohm G.m.b.H., Hamburg (West Germany).
EUROPLANE QTOL: DESIGN PARAMETER TRADEOFFS c07
Dieter Burkhardt *In* Tech. Hochschule Aachen Short Course on STOL Aircraft Technol. and the Community, Vol. 1 1974 44 p

Design parameter tradeoffs, performed on a commercial transport aircraft of the 180 to 200 scale category, are discussed. Constraints imposed were a fixed configuration, fixed engines, e.g. RB211, and a fixed flap system. The high sensitivity of aircraft direct operating cost (DOC) with respect to the specification assumed is pointed out. The field length, especially, has severe implications on DOC. ESRO

N75-11943 Tennessee Univ. Space Inst., Tullahoma.
AERODYNAMICS OF HIGH-LIFT DEVICES
W. F. Jacobs *In* Tech. Hochschule Aachen Short Course on STOL Aircraft Technol. and the Community, Vol. 1 1974 75 p refs

The requirement for a good and effective high lift system for the development of STOL aircraft is discussed and various methods of greatest interest are considered. The aerodynamic characteristics of the systems are compared and evaluated. Theoretical methods for calculating the aerodynamic forces on powered high lift systems are also included. ESRO

N75-11944 Tennessee Univ. Space Inst., Tullahoma.
AIR CUSHION LANDING SYSTEMS FOR AIRCRAFT
B. H. Goethert *In* Tech. Hochschule Aachen Short Course on STOL Aircraft Technol. and the Community, Vol. 1 1974 29 p refs

Short takeoff aircraft current state-of-the-art is briefly summarized. Aircraft equipped with an air cushion landing system have the capability of operating on prepared and unprepared surfaces, such as hard runways, water, swamps, slush and loose snow without necessitating any changes of the landing system. These systems have the characteristic that they permit an airplane to move not only in the longitudinal direction, as is the normal case as airplanes equipped with wheels, but also in the lateral or any other direction as desired. Detailed descriptions of the aircushions, the auxiliary cushion air compressor system, the control system for ground operation, etc., are given. The feasibility of the system was demonstrated in extensive tests. ESRO

N75-11945 Bodenseewerk Geraetetechnik G.m.b.H., Ueberlingen (West Germany).
ASPECTS OF GUIDANCE AND CONTROL FOR STEEP AND CURVED APPROACHES OF STOL AIRCRAFT
Gunther W. Schaenzer *In* Tech. Hochschule Aachen Short Course on STOL Aircraft Technol. and the Community, Vol. 1 1974 44 p

A newly-developed STOL flight control system designed to relieve pilot load and to permit accurate path control and precise control of the aerodynamic state of flow with greater passenger comfort was investigated. The characteristics of the new system were demonstrated with a Dornier Skyservant aircraft and more than 500 fully automatic landing have been made. The tests include approach, flare, and ground roll down to 24 knots I.A.S., and the automatic landing capacity is demonstrated. ESRO

N75-11946# Technische Hochschule, Aachen (West Germany). Inst. fuer Luft- und Raumfahrt.
SHORT COURSE ON STOL AIRCRAFT TECHNOLOGY AND THE COMMUNITY, VOLUME 2
1974 332 p refs Conf. held at Aachen, 18-22 Mar. 1974 and Tullahoma, Tenn., 22-26 Apr. 1974 Prepared jointly with Univ. of Tenn. Space Inst.
Avail: NTIS HC $9.50

N75-11947 Du Pont Aerospace Co., Inc., Torrance, Calif.
ENGINES FOR COMMERCIAL STOL TRANSPORTS
A. A. duPont *In* Tech. Hochschule Aachen Short Course on STOL Aircraft Technol. and the Community, Vol. 2 1974 19 p

High bypass turbofan models are selected on the basis of noise, operating economics, and reliability. A compromise among thermodynamic factors, bypass ratio, and mechanical arrangements is suggested taking into account existing examples. ESRO

N75-11948 Motoren- und Turbinen-Union Muenchen G.m.b.H. (West Germany).
PROPULSION CONCEPTS FOR STOL AIRCRAFT
H. Grieb, W. Klussmann, and G. Weist *In* Tech. Hochschule Aachen Short Course on STOL Aircraft Technol. and the Community, Vol. 2 1974 58 p refs

In view of the possibility of applying STOL capabilities to jet transport aircraft, the technical scope for developing high bypass cruise engines and for designing air supply systems for wings with internally blown flaps are identified and dealt with. The effect of bypass ratio on static and takeoff thrust and on general dimensioning is considered. Engine noise and technical problems are elucidated. Experimental results on air supply requirements and noise emission of airfoils with externally blown flaps and various concepts for internally blown flaps are depicted. Various air supply systems are reviewed and compared. ESRO

N75-11949 Messerschmitt-Boelkow-Blohm G.m.b.H., Hamburg (West Germany).
INVESTIGATIONS INTO AIRCRAFT NOISE REDUCTION BY SHIELDING c07
Gerd Saphir *In* Tech. Hochschule Aachen Short Course on STOL Aircraft Technol. and the Community, Vol. 2 1974 36 p refs

Flyover noise shielding is achieved by the specific positioning of engines with respect to wings and airframe. Noise shielding formulas are compared and experimental results are presented graphically. ESRO

N75-11950 Tennessee Univ. Space Inst., Tullahoma.
SOME RESULTS OF AEROACOUSTIC RESEARCH
B. H. Goethert *In* Tech. Hochschule Aachen Short Course on STOL Aircraft Technol. and the Community, Vol. 2 1974 13 p refs

N75-11951 Technische Hochschule, Aachen (West Germany).
NOISE OF JETS WHICH ARE IMPINGING ON OBSTACLES (FOR EXAMPLES EXTERNALLY BLOWN FLAPS) AND POSSIBILITIES OF NOISE ATTENUATION c07
G. Neuwerth *In* Tech. Hochschule Aachen Short Course on STOL Aircraft Technol. and the Community, Vol. 2 1974 16 p refs

The acoustic mechanism of the noise radiation caused by a subsonic (or supersonic) free jet impinging on an obstacle was studied. The natural orderly structure of turbulence of a subsonic free jet at Mach numbers between 0.5 and 1.0 was examined, and the reinforcement of the first harmonic of the axisymmetric structure by the feedback mechanism established. The interaction noise was amplified by an externally blown flap as an obstacle. The ring vortices reinforced by feedback can be destroyed if they are cut off at one point of their periphery and the total sound power level can be reduced about 10 db. Results show that the natural orderly structure cannot be destroyed but only weakened. ESRO

N75-11952 Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
DEVELOPMENT AND APPLICATIONS OF THE AIR CUSHION LANDING SYSTEM
K. H. Digges *In* Tech. Hochschule Aachen Short Course on STOL Aircraft Technol. and the Community, Vol. 2 1974 24 p refs

The use of an air cushion system fitted to an aircraft to permit it to land on unfavorable and unsuitable terrain where an aircraft with conventional landing gear would get bogged down is discussed. A suitable braking system to be used in conjunction with the air cushion system is described. Flight tests with a Lake LA-4 amphibian aircraft fitted with the system showed such impressive results that a program has been initiated to fit the system to a 40,000 lb gross weight De Havilland Buffalo transport. ESRO

N75-11953# Illinois Univ., Savoy. Aviation Research Lab.
CONTROL AUTHORITY WITH A FLIGHT PERFORMANCE CONTROLLER
Craig A. Bergman, Kenneth R. Sivier, and Stanley N. Roscoe Oct. 1973 9 p refs Presented at the 17th Ann. Meeting of the Human Factors Soc., Washington, D. C., 16-18 Oct. 1973
(Contract F44620-70-C-0105; AF Proj. 9778)
(AD-784889; ARL/73-23/AFOSR-73-14; AFOSR-74-1351TR) Avail: NTIS CSCL 01/3

A performance control system (PCS) that allows direct pilot control of aircraft bank angle and vertical speed has been developed and flight tested in a twin-engine general aviation aircraft. The control-response relationships are discussed for both the conventional controls and the PCS. The reduction of control authority with the PCS and the resulting flying qualities are presented. Author (GRA)

N75-11954# Naval Ship Research and Development Center, Bethesda, Md. Aviation and Surface Effects Dept.
TWO-DIMENSIONAL SUBSONIC EVALUATION OF A 15-PERCENT THICK CIRCULATION CONTROL AIRFOIL WITH SLOTS AT LEADING AND TRAILING EDGES
Jonah Ottensoser Jul. 1974 65 p refs
(WF41421210)
(AD-785230; Aero-1197; NSRDC-4456) Avail: NTIS CSCL 01/1

A 15-percent-thick circulation control elliptical airfoil section with slots at both leading and trailing edges for tangential blowing was evaluated in a subsonic wind tunnel to determine its potential for high-speed (300-400 knot) helicopter rotor systems. Fore-and-aft slot utilization were determined by local flow direction over the blade as it revolved around the azimuth. Aerodynamic performance was not affected by the addition of an unblown leading edge slot except beyond the usable positive angle of attack range where some loss in lift and increase in drag were noted. At equal plenum pressures, simultaneous blowing from the leading and trailing edges resulted in a decrease in lift, an increase in drag, and a more positive pitching moment than for trailing edge blowing alone. (Modified author abstract) GRA

N75-11955# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
A SPECTRUM TRUNCATION AND DAMAGE TOLERANCE STUDY ASSOCIATED WITH THE C-5A OUTBOARD PYLON AFT TRUSS LUGS
J. P. Gallagher, H. D. Stalnaker, and J. L. Rudd May 1974 52 p refs
(AF Proj. 410A)
(AD-785196; AFFDL-TR-74-5) Avail: NTIS CSCL 01/3

A simplified lug specimen configuration is subjected to two load spectra derived from the same exceedance data: (1) a 17 level block loading program, and (2) a 14-mission flight-by-flight loading program. Crack growth data from the two spectra for this PH 13-8Mo material are compared on a life basis; each spectrum contained an equal number of Ground Air Ground (GAG) cycles per lifetime. An analysis of the effect associated with the degree of truncation to which the flight spectrum could be subjected was performed using the conservative no retardation - no load interaction crack growth model and the Willenborg crack growth retardation model. The stress intensity factor calibration developed using finite element techniques is supplemented with stress intensity factor values obtained using the Anderson - James inverse approach. Additional tests on 7075-T6 aluminum are described which investigate the importance of load redundancy. Author (GRA)

N75-11956# Budd Co., Fort Washington, Pa. Technical Center.
DESIGN AND MOCKUP EVALUATION OF A HIGH-STRENGTH ARMORED CREW SEAT FOR TRANSPORT/CARGO AIRCRAFT
Edwin W. Hammer, Jr. and Richard L. Peterson Jun. 1974 134 p refs
(Contract F33615-71-C-1411; AF Proj. 1425)
(AD-785145; AFFDL-TR-73-47) Avail: NTIS CSCL 01/3

Conceptual layout drawings of six armored crew seat systems for use in transport/cargo aircraft were developed and evaluated. The initial seating concepts included attenuation in all three axes. In one of the early concepts, the effect of sliding friction during the attenuation stroke was completely eliminated by allowing certain key components to rotate to gain the necessary translation. In the final design, attenuation was obtained by sliding on conventional tracks; however, attenuation in the lateral direction was eliminated because lateral space and weight became critical. To obtain the most efficient seat system in terms of cost, weight, and space, concurrent studies were conducted to investigate armor materials, energy absorbers, restraint systems, seat cushions and head rests to determine the most efficient parameters for each. As a result, boron carbide was chosen for the armor, a commercially available energy absorber known as Tor-Shok for the attenuators, and a modified F-111 harness for the restraint system; and the material thickness and dimensions for the seat cushion and head rest were defined. (Modified author abstract) GRA

N75-11957# General Dynamics/Convair, San Diego, Calif.
INTERACTIVE COMPUTER-AIDED DESIGN AIRCRAFT FLYING QUALITIES PROGRAM. VOLUME 1: USERS MANUAL Final Report, 1 Jan. - Aug. 1974
G. Place, H. M. Altmann, L. G. Barbee, G. F. Campbell, Jr., and E. R. Neuharth Aug. 1974 266 p refs
(Contracts F33615-74-C-4068; F33615-73-C-4081; AF Proj. C093)
(AD-785101; ASD/XR-74-17-Vol-1) Avail: NTIS CSCL 01/1

This report describes a digital computer program which calculates the longitudinal and lateral-directional stability and control derivatives and aircraft flying qualities for a Mach number range for 0 - 3.0. The report consists of four volumes. Volume I, Users Manual, contains a detailed description of the input/output options, program limitations, input/output data, and a set of sample problems. Volume IV, Program Assessment/Correlation Report, presents the results of the correlation studies and conclusions pertaining to the validity of the methodology. The computer program is written in FORTRAN IV Extended language for the CDC 6600 operating system. However, it is designed to be adapted to other operating systems because use of unique features peculiar to a given processor has been avoided whenever practical. User oriented features are included in the program to provide minimum input data requirements, flexible input/output control options and substitution of experimental data for aerodynamic characteristics. (Modified author abstract) GRA

N75-11958# General Dynamics/Convair, San Diego, Calif.
INTERACTIVE COMPUTER-AIDED DESIGN AIRCRAFT FLYING QUALITIES PROGRAM. VOLUME 2: METHODS FORMULATION MANUAL Final Report, 1 Jan. - Aug. 1974
G. Place, H. M. Altmann, L. G. Barbee, G. F. Campbell, Jr., and E. R. Neuharth Aug. 1974 132 p refs
(Contracts F33615-74-C-4068; F33615-73-C-4081; AF Proj. C093)
(AD-785102; ASD/XR-74-17-Vol-2) Avail: NTIS CSCL 01/1

This report describes a digital computer program which calculates the longitudinal and lateral-directional stability and control derivatives and aircraft flying qualities for a Mach number range for 0 - 3.0. The report consists of four volumes. Volume II, Methods Formulation Manual, outlines the methodology and source, range of applicability, and modifications. (Modified author abstract) GRA

N75-11959# General Dynamics/Convair, San Diego, Calif.
INTERACTIVE COMPUTER-AIDED DESIGN AIRCRAFT FLYING QUALITIES PROGRAM. VOLUME 3: COMPUTER PROGRAMMING MANUAL Final Report, 1 Jan. - Aug. 1974
G. Place, H. M. Altmann, L. G. Barbee, G. F. Campbell, Jr., and E. R. Neuharth Aug. 1974 457 p
(Contracts F33615-74-C-4068; F33615-73-C-4081; AF Proj. C093)
(AD-785103; ASD/XR-74-17-Vol-3) Avail: NTIS CSCL 01/1

This report describes a digital computer program which calculates the longitudinal and lateral-directional stability and control derivatives and aircraft flying qualities for a Mach number range for 0 - 3.0. Volume III, Computer Programming Manual, outlines the program organization, input/output of each module/subroutine, module or subroutine function, program listings and flow charts. The computer program is written in FORTRAN IV Extended language for the CDC 6600 operating system. (Modified author abstract) GRA

N75-11960# General Dynamics/Convair, San Diego, Calif.
INTERACTIVE COMPUTER-AIDED DESIGN AIRCRAFT FLYING QUALITIES PROGRAM. VOLUME 4: PROGRAM ASSESSMENT/CORRELATION REPORT Final Report, 1 Jan. - Aug. 1974
G. Place, H. M. Altmann, L. G. Barbee, G. F. Campbell, Jr., and E. R. Neuharth Aug. 1974 203 p refs
(Contracts F33615-74-C-4068; F33615-73-C-4081; AF Proj. C093)
(AD-785104; ASD/XR-74-17-Vol-4) Avail: NTIS CSCL 01/1

This report describes a digital computer program which calculates the longitudinal and lateral-directional stability and control derivatives and aircraft flying qualities for a Mach number range for 0 - 3.0. The report consists of four volumes. Volume IV, Program Assessment/Correlation Report, presents the results of the correlation studies and conclusions pertaining to the validity of the methodology. (Modified author abstract) GRA

N75-11961# Systems Associates, Inc., Long Beach, Calif.
U. S. ARMY HELICOPTER ELECTRICAL SYSTEM RELIABILITY AND MAINTAINABILITY INVESTIGATION. VOLUME 1: DOCUMENT DEFICIENCY ANALYSIS Final Report
Clifford E. Nord May 1974 261 p refs
(Contract DAAJ02-73-C-0020; DA Proj. 1F1-62203-A-119)
(AD-785573; SAI-R73-011-1-Vol-1; USAAMRDL-TR-73-97A-Vol-1) Avail: NTIS CSCL 01/3

The investigation was performed in order to identify deficiencies in military specifications and standards concerning electrical systems in U.S. Army helicopters. The three areas of concern that have impact on helicopter reliability and maintainability are: Design requirements; qualification test requirements, procedures, and practices; and quality assurance provisions and requirements. The helicopters selected are the AH-1G Cobra, UH-1D/H Iroquois, OH-6A Cayuse, CH-47A Chinook, and the CH-54A Tarhe. Schematics of each model helicopter electrical system were analyzed, and a composite schematic was constructed to represent all circuits, equipments, and component parts of all models. This composite schematic provided a baseline system on which to build an electrical system documentation tree. Author (GRA)

N75-11962# Systems Associates, Inc., Long Beach, Calif.
U. S. ARMY HELICOPTER ELECTRICAL SYSTEM RELIABILITY AND MAINTAINABILITY INVESTIGATION. VOLUME 2: SUPPLEMENTAL DESIGN GUIDE
Clifford E. Nord May 1974 291 p refs
(Contract DAAJ02-73-C-0020; DA Proj. 1F1-62203-A-119)
(AD-785574; SAI-R73-011-2-Vol-2; USAAMRDL-TR-73-97B-Vol-2) Avail: NTIS CSCL 01/3

The volume is a result of the investigation performed in Volume I Document Deficiency Analysis of this report, which identifies deficiencies in military specifications and standards that have impact in reliability and maintainability of U.S. Army helicopters. The volume provides supplementary information to each deficient document relating to design requirements, qualification testing, and quality assurance. The supplementary information to offset the most prevalent deficiencies were addressed to helicopter mission design requirements which relate to environmental conditions, reliability and maintainability programs, and safety. Environmental testing and reliability and maintainability requirements were also addressed. This supplementary information may be used for future helicopter procurement purposes, or may eventually be incorporated into existing aircraft electrical systems documents. Author (GRA)

N75-11963# Army Material Command, Texarkana, Tex. Intern Training Center.
USE OF CHOLESTERIC LIQUID CRYSTALS FOR LOCATING VOIDS IN ADHESIVELY BONDED HELICOPTER ROTOR BLADES Final Report
Larry V. Best Mar. 1974 52 p refs
(AD-785502; USAMC-ITC-02-08-73-029) Avail: NTIS CSCL 01/3

This paper researches the feasibility for using cholesteric liquid crystals for locating the unbonded areas or voids in adhesively bonded helicopter rotor blades. Results of testing two tail rotors are presented and analyzed. A general review of other nondestructive testing methods for rotor blades and a review of liquid crystals is also included. Author (GRA)

N75-11964# Army Aviation Systems Test Activity, Edwards AFB, Calif.
ENGINEERING FLIGHT TEST, AH-1G HELICOPTER, HEAVYWEIGHT AUTOROTATIONAL EVALUATION Final Report
Joseph C. Watts, George M. Yamakawa, Leslie J. Hepler, and Leonard M. Free May 1974 29 p refs
(AD-785553; USAASTA-74-10) Avail: NTIS CSCL 01/3

Engineering flight tests were conducted by the United States Army Aviation Systems Test Activity to determine if any adverse autorotational entry or landing characteristics would preclude increasing the maximum operational gross weight of the AH-1G helicopter above the current 9500 pounds. A production AH-1G helicopter with tractor tail rotor was flown 14.4 hours at Edwards Air Force Base, California between 26 September and 12 October 1973 in the Hog configuration. Autorotational entries were performed successfully at gross weights from 9000 to 10,000 pounds from climbs, level flight, and dives. (Modified author abstract) GRA

N75-11965# Army Materiel Command, Alexandria, Va.
ENGINEERING DESIGN HANDBOOK: HELICOPTER PERFORMANCE TESTING
1 Aug. 1974 262 p refs
(AD-785000; AMCP-706-204) Avail: NTIS CSCL 01/3

As the state of the art advances, the helicopter becomes more complex with accompanying difficulties in the development cycle. Also, the customer organizations become larger, more efficient, demand more reliability and accuracy, and in general, refine their capability in all areas. The manufacturers and government in turn are forced to provide more comprehensive and accurate information about the product, thus requiring an ever increasing flight test effort. This handbook discusses flight testing as it relates to helicopter performance determinations. GRA

N75-11966# Explosive Technology, Inc., Fairfield, Calif.
AN EMERGENCY LIFE SAVING INSTANT EXIT SYSTEM FOR CARGO, CARGO-TRANSPORT AND PASSENGER AIRCRAFT, VOLUME 2 Technical Report, Jun. 1971 - May 1973
M. C. Anderson and Frank B. Burkdoll Feb. 1974 31 p refs
(Contract F33657-70-C-1138)
(AD-778824; ASD-TR-71-41-Vol-2) Avail: NTIS CSCL 06/7

The results of flight testing phase of an Emergency Life-Saving Instant Exit (ELSIE) System for military and commercial cargo, cargo-transport and passenger aircraft are described. ELSIE System opens emergency exits in aircraft almost instantaneously and can be designed to open all exits at one time or on a selective basis. The Flight-Test Directorate of the Aeronautical Systems Division, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio, performed the described testing. The design

evolved from Explosive Technology's STEN (Stored Energy) Passenger Egress System originally developed in 1967 and continuously demonstrated since then. This document is Volume 2 of a two-volume report. Volume 1 describes the design and ground-test phases of the program. Author (GRA)

N75-11967# Beckman Instruments, Inc., Fullerton, Calif. Advanced Technology Operations.
OXYGEN CONCENTRATION SENSOR FOR AIRCRAFT FUEL TANKS Final Technology Report, 1 Nov. 1972 - 5 May 1974
Jean Bordeaux and M. W. Greene May 1974 54 p
(Contract F33615-73-C-2008; AF Proj. 3048)
(AD-785144; FR-2653-102; AFAPL-TR-74-17) Avail: NTIS CSCL 07/4

The ullage in aircraft fuel tanks becomes potentially explosive when the oxygen concentration of the fuel vapor-air mixture exceeds approximately 9% by volume. To insure effective and efficient use of active fuel tank inerting under a wide range of environmental and operational conditions, the oxygen concentration must be continuously monitored. This study has resulted in the development of a laboratory breadboard model of a sensor which is specific for oxygen. The concept employs a change in frequency of a radio-frequency (RF) oscillator due to the paramagnetic property of oxygen. Demonstration of feasibility was limited to ambient laboratory conditions. Author (GRA)

N75-11968# Naval Air Development Center, Warminster, Pa. Air Vehicle Technology Dept.
CLEANING AND CORROSION CONTROL OF AVIONICS EQUIPMENT AT ALL LEVELS OF MAINTENANCE Progress Report
W. E. MacKenzie and W. E. Knight 30 Apr. 1974 21 p
(AD-784975; NADC-74049-30) Avail: NTIS CSCL 01/3

This report covers a survey of cleaning and corrosion problems encountered with avionics systems, the application of a new cleaner for components, and a process for corrosion control of avionics components and systems at the three maintenance levels. Author (GRA)

N75-11969# Committee on Science and Astronautics (U. S. House).
AIRCRAFT NOISE ABATEMENT
Washington GPO 1974 1041 p refs Hearings before Subcomm. on Aeron. and Space Technol. of Comm. on Sci. and Astronaut., 93d Congr., 2d Sess., No. 44, 24-25 Jul. 1974; 5, 6, and 18 Dec. 1973
(GPO-41-298) Avail: Subcomm. on Aeron. and Space Technol.

Various proposals were suggested by witnesses from established airports, aircraft manufacturing firms, and government agencies at the aircraft noise abatement hearings in Congress. Noise contours for Los Angeles International Airport are included, along with proposed structural changes in engine design to reduce noise. J.A.M.

N75-11971*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CONTINUOUS-OUTPUT TERMINAL-SHOCK-POSITION SENSOR FOR MIXED-COMPRESSION INLETS EVALUATED IN WIND TUNNEL TESTS OF YF-12 AIRCRAFT INLET
Miles O. Dustin, Gary L. Cole, and George H. Neiner Washington Dec. 1974 25 p refs
(NASA-TM-X-3144; E-7808) Avail: NTIS HC $3.25 CSCL 21E

An electronic sensor was built to measure the position of the terminal shock in a supersonic inlet. The sensor uses several static-pressure taps in the inlet wall. The sensor output is continuously proportional to shock position. When the sensor was installed in a YF-12 aircraft flight inlet during wind tunnel tests, it indicated shock position within + or - 5 percent of the total distance covered by the static-pressure-tap region. The maximum error caused by an angle of attack change of 4 deg was less than 25 percent. In the region of normal inlet operation, the angle of attack error is negligible. Frequency-response tests show the amplitude ratio is constant out to 60 Hz, and decreases to about 50 percent at 100 Hz, with a phase lag of 50 deg. Author

N75-11972*# Pratt and Whitney Aircraft, West Palm Beach, Fla. Research and Development Center.
EFFECT OF SWIRLING FLOW ON AUGMENTOR PERFORMANCE Final Report, Jun. 1973 - Jun. 1974
T. R. Clements Nov. 1974 90 p refs Original contains color illustrations
(Contract NAS3-17348)
(NASA-CR-134639; FR-6534) Avail: NTIS HC $4.75 CSCL 21E

A test program was conducted with an augmentor which employed swirling flow as a means of promoting rapid flame propagation. The program evaluated the effect of augmentor length, swirl intensity, fuel zoning and Mach number on augmentor performance. Combustion efficiencies near 100% were demonstrated over most of the operating range which extended from an equivalence ratio of 0.2 to over 1.0. The tests were conducted at an inlet temperature of 649 C (1200 F) and at a pressure of 2 atmospheres. The augmentor total pressure losses were typical of current state of the art augmentors. Author

N75-11973*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A FOREBODY DESIGN TECHNIQUE FOR HIGHLY INTEGRATED BOTTOM-MOUNTED SCRAMJETS WITH APPLICATION TO A HYPERSONIC RESEARCH AIRPLANE
C. L. W. Edwards Nov. 1974 40 p refs
(NASA-TM-X-71971) Avail: NTIS HC $3.75 CSCL 21A

An inviscid technique for designing forebodies which produce uniformly precompressed flows at the inlet entrance for bottom-mounted scramjets has been developed so that geometric constraints resulting from design trade-offs can be effectively evaluated. The flow fields resulting from several forebody designs generated in support of a hypersonic research airplane conceptual design study have been analyzed in detail with three-dimensional characteristics calculations to verify the uniform flow conditions. For the designs analyzed, uniform flow is maintained over a wide range of flight conditions (Mach number equals 4 to 10; angle of attack equals 6 deg to 10 deg) corresponding to scramjet operation flight envelope of the research airplane. Author

N75-11974*# Princeton Univ., N.J. Guggenheim Lab. for the Aerospace Propulsion Sciences.
FUNDAMENTAL AND APPLIED RESEARCH ON CORE ENGINE/COMBUSTION NOISE OF AIRCRAFT ENGINES Annual Report
E. G. Plett, M. D. Leshner, and M. Summerfield Jul. 1974 32 p refs
(Grant NGR-31-001-307)
(NASA-CR-140860; AR-1) Avail: NTIS HC $3.75 CSCL 21E

Some results of a study of the importance of geometrical features of the combustor to combustion roughness and resulting noise are presented. Comparison is made among a perforated can flame holder, a plane slotted flame holder and a plane slotted flame holder which introduces two counter swirling streams. The latter is found to permit the most stable, quiet combustion. Crosscorrelations between the time derivative of chamber pressure fluctuations and far field noise are found to be stronger than between the far field noise and the direct chamber pressure signal. Temperature fluctuations in the combustor nozzle are also found to have a reasonably strong crosscorrelation with far field sound. Author

N75-11979# Hawker Siddeley Aviation, Ltd., Hatfield (England). Aerodynamics Dept.
ATMOSPHERIC ATTENUATION OF AIRCRAFT NOISE. EXPERIMENTAL VALVES MEASURED IN A RANGE OF CLIMATIC CONDITIONS, VOLUME 1 Final Report
Christine M. Smith Sep. 1973 211 p refs Sponsored by Ministry of Defence 2 Vol.
(HSA-HAD-R-GEN-214-Vol-1) Avail: NTIS HC $7.25 CSCL 20A

Experimental data was required for the purpose of assessing the standard atmospheric attenuation coefficients in current use and so controlled field measurements were made at eleven locations in the United States and Europe under more than twenty different climatic conditions in the range 0 to 35 C and 25% to 95% relative humidity. A Hawker Siddeley H.S. 125 aircraft provided the noise source, flying straight and level at various heights above a single measuring position. Meteorological data was sampled at altitude and at the noise measuring position during each flyover. Atmospheric attenuation coefficients for the one-third octave bands of frequency from 50 Hz to 10 kHz were derived from the aircraft noise recordings. Measurement procedures were selected so that the effects of ground reflection and absorption, background noise, Doppler shift and source directivity were almost entirely eliminated from the results.
Author

N75-11980# Hawker Siddeley Aviation, Ltd., Hatfield (England). Aerodynamics Dept.
ATMOSPHERIC ATTENUATION OF AIRCRAFT NOISE. EXPERIMENTAL VALVES MEASURED IN A RANGE OF CLIMATIC CONDITIONS, VOLUME 2 Final Report
Christine M. Smith Sep. 1973 85 p refs Sponsored by Ministry of Defence 2 Vol.
(HSA-HAD-R-GEN-214-Vol-2) Avail: NTIS HC $4.75 CSCL 20A

N75-11982*# Lockheed-California Co., Burbank.
MEASUREMENT AND ANALYSIS OF AIRCRAFT FAR-FIELD AERODYNAMIC NOISE Final Report
Gerald J. Healy Washington NASA Dec. 1974 71 p refs (Contract NAS1-12440)
(NASA-CR-2377; LR-26195) Avail: NTIS HC $4.25 CSCL 20A

A systematic investigation of aircraft far-field radiated, aerodynamically generated noise was conducted. The test phase of the original program involved the measurement of the noise produced by five gliding aircraft in an aerodynamically clean configuration during low altitude flyovers. These aircraft had gross weights that ranged from 5785 to 173 925N (1300 to 39,000 pounds), fly-by velocities from 30 to 98.5m/sec (58 to 191.5 knots or 98 to 323 ft/sec) and wing aspect ratios from 6.59 to 18.25. The results of these measurements were used to develop an equation relating aerodynamic noise to readily evaluated physical and operational parameters of the aircraft. A non-dimensional frequency spectrum, based on the mean wing thickness, was also developed.
Author

N75-11983*# General Electric Co., Cincinnati, Ohio.
CASCADE TESTS OF SERRATED LEADING EDGE BLADING AT HIGH SUBSONIC SPEEDS Final Report
E. G. Smith Washington NASA Dec. 1974 94 p refs (Contract NAS2-5462)
(NASA-CR-2472) Avail: NTIS HC $.75 CSCL 21E

Cascade tests of two-dimensional fan rotor blade rows were performed to investigate the effects of leading edge serration on acoustic and aerodynamic performance. The test configurations covered a range of serration tooth geometries. Tests were performed to investigate effects of inlet air angle and velocity on performance. Aerodynamic performance was determined by flow surveys at the mid-span of the blade exit. Acoustic performance was determined by wake turbulence surveys and sound measurements in the semireverberent exhaust chamber. Measured acoustic and aerodynamic performance was comparable and indicated that a serration length of about six percent blade chord yields minimum noise generation and minimum total pressure losses.
Author

N75-11984*# Boeing Commercial Airplane Co., Seattle, Wash.
A 727/JT8D-100 SERIES ENGINE EXHAUST SYSTEM PROPULSION PERFORMANCE MODEL TEST
W. J. Haugan and P. R. A. Kern May 1974 424 p (Contract NAS3-17842)
(NASA-CR-134617; D6-41805) Avail: NTIS HC $10.50 CSCL 21E

The results are presented from testing one-eighth scale models of the Pratt and Whitney aircraft reference and Boeing nozzles for the JT8D-100 series mixed flow engines. The objective of the test was to obtain the nozzle velocity and flow coefficients for the reference configurations and compare these with the Boeing configurations which incorporated a longer splitter between the fan and primary flows. A further comparison was made between the JT8D-100 series nozzles and the Boeing JT8D-9/727 production nozzle performance. A statistical analysis was used to compare configurations which showed the performance (velocity coefficient) of the reference and the Boeing configuration was the same for the JT8D-109. It also showed no difference between reference and the Boeing configuration for the JT8D-115 and no difference for the JT8D-117 nozzles. Bypass ratio (match) was shown to be equally dependent on splitter position as on nozzle area within the range investigated. The nozzles were very similar in flow coefficient within an engine family. Excellent profile data was recorded. The effects of swirl on the nozzle performance was examined and found to degrade the velocity and flow coefficients.
Author

N75-11985*# Boeing Co., Wichita, Kans.
ACOUSTIC ATTENUATION DESIGN REQUIREMENTS ESTABLISHED THROUGH EPNL PARAMETRIC TRADES
Henry F. Veldman 1972 248 p refs (Contract NAS3-14321)
(NASA-CR-120986; D3-8686) Avail: NTIS HC $7.50 CSCL 20A

An optimization procedure for the provision of an acoustic lining configuration that is balanced with respect to engine performance losses and lining attenuation characteristics was established using a method which determined acoustic attenuation design requirements through parametric trade studies using the subjective noise unit of effective perceived noise level (EPNL).
Author

N75-11986# Naval Air Engineering Center, Philadelphia, Pa. Ground Support Equipment Dept.
IN-AIRFRAME GROUND RUNUP NOISE SUPPRESSOR PROGRAM Final Report
Eugene T. Pulcher 15 Mar. 1974 121 p refs
(AD-785246; NAEC-GSED-78) Avail: NTIS CSCL 01/3

An effort to control the noise generated by twelve (12) different aircraft in the Navy inventory was undertaken. Existing Suppressor Systems were studied. Design parameters were established and optimized through computer studies.
Author (GRA)

N75-11989# Bolt, Beranek, and Newman, Inc., Canoga Park, Calif.
COMMUNITY NOISE EXPOSURE RESULTING FROM AIRCRAFT OPERATIONS: COMPUTER PROGRAM OPERATION'S MANUAL Final Report
Nicolaas H. Reddingius Jul. 1974 218 p refs
(Contract F33615-74-C-4160; AF Proj. 7231)
(AD-785360; BBN-2582; AMRL-TR-73-108) Avail: NTIS CSCL 20/1

A user oriented description of a computer program to calculate community noise exposure due to aircraft operations is given. Formal definition of all allowable card sequences and examples of coding for all types of aircraft operations are presented as well as guidelines for efficient use. The program which is entirely written in FORTRAN 4 produces printed output as well as output compatible with the CALCOMP GPCP contouring package. A discussion of the architecture of the program and the interpretation of the output can be found in companion volumes AMRL-TR-109 and AMRL-TR-73-105, respectively. Author (GRA)

N75-11990# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
COMBUSTION GENERATED NOISE IN TURBOPROPULSION SYSTEMS Interim Report, Jun. 1973 - May 1974
W. C. Strahle, B. N. Shivashankara, J. C. Handley, and M. Muthukrishnan Jan. 1974 70 p refs
(Grant AF-AFOSR-2365-72; AF Proj. 9711)
(AD-785485; AFOSR-74-1438TR) Avail: NTIS CSCL 21/2

Continuation of experimental and theoretical work on the problem of combustion generated noise in turbopropulsion systems is presented. Tasks completed during the current period have been (a) experimental and theoretical correlation of noise power and spectra from open premixed flames of propane, propylene, ethylene and acetylene-air, (b) crosscorrelation of C2 emission with the far field acoustic pressure, and (c) experimental and theoretical investigation of ducting effects upon the noise radiating capability of the flame. The noise radiation from simple flame types is now understood with sufficient theoretical and experimental detail that estimates may be made for combustion noise in turbopropulsion systems. (Modified author abstract) GRA

N75-11991# Pennsylvania State Univ., University Park. Applied Research Lab.
EFFECT OF BLADE ROW GEOMETRY ON AXIAL FLOW ROTOR UNSTEADY RESPONSE TO INFLOW DISTORTIONS
Robert E. Henderson and Edgar P. Bruce 18 Jul. 1974 34 p refs
(Contract N00017-73-C-1418)
(AD-785276; TM-74-224) Avail: NTIS CSCL 21/5

Employing a recently developed experimental apparatus, the authors have measured the unsteady response of an isolated axial flow fan rotor to inflow distortions. The measured quantities include the unsteady normal force and pitching moment on a segment of a single blade operating at various mean angles of attack and the associated distribution of time-mean total pressure change across the rotor. These results are part of a larger program that includes variations in the mean angle of attack in reduced frequency omega, in blade stagger angle, and in blade row space-to-chord ratio (S/C). The effect of variations in omega and S/C on the unsteady response are presented. (Modified author abstract) GRA

N75-11992# Princeton Univ., N.J. Dept. of Aerospace and Mechanical Sciences.
RESEARCH ON NOISE GENERATED BY DUCTED AIR-FUEL COMBUSTION SYSTEMS Annual Report, Mar. 1973 - Feb. 1974
E. G. Plett, H. H. Chiu, and M. Summerfield Jun. 1974 30 p refs
(Contract N00014-67-A-0151-0029)
(AD-785028; AR-3) Avail: NTIS CSCL 21/5

A two-pronged approach to the study of noise generation by combustion in a confined flow system, similar to a jet engine configuration, has been followed. One aspect deals with the mechanisms of noise generation by combustion; the other aspect deals with the effect of confinement on the noise generation and radiating properties of an unsteady combustion-duct-flow interaction. Mechanisms of sound generation, amplification and scattering by various combustion systems have been studied on theoretical bases compatible with the contemporary understanding of unsteady burning processes. Sound generation mechanisms are classified into categories relating to the Smith-Kilham emission mechanism and the turbulent driven Rijke-Riess emission mechanism. (Modified author abstract) GRA

N75-11993# Rochester Applied Science Associates, Inc., N.Y.
DEVELOPMENT OF AN IMPROVED DESIGN TOOL FOR PREDICTING AND SIMULATING HELICOPTER ROTOR NOISE Final Report
H. Kevin Johnson Jun. 1974 48 p refs
(Contract DAAJ02-73-C-0061; DA Proj. 1F1-62204-AA-43)
(AD-785579; RASA-74-02; USAAMRDL-TR-74-37) Avail: NTIS CSCL 20A

The rotor noise prediction program has been improved by the following items: (1) inclusion of the helicopter rotor noise ground reflection phenomenon, (2) inclusion of the variability of oscillatory forces as related to the vortex shedding phenomenon, (3) expansion of the data base for the broadband noise data bank, and (4) description of a calculation procedure which demonstrates how the program input deck can be modified to account for impulse signals of single-rotor blade vortex interactions. The rotor noise prediction program has been developed so that the acoustic characteristics of new, untested rotor designs could be evaluated as well as the effects of basic design changes on the acoustic signature of existing rotors. (Modified author abstract) GRA

N75-11994# Colt Industries, Inc., West Hartford, Conn. Chandler Evans Control Systems Div.
TURBINE ENGINE FUEL CONTROL RELIABILITY TEST AND EVALUATION Final Report, 20 Jun. 1973 - 22 Mar. 1974
R. D. Zagranski, R. M. Lamart, and A. H. White Jul. 1974 94 p refs
(Contract DAAJ02-73-C-0104; DA Proj. 1F1-62205-A-119)
(AD-785580; USAAMRDL-TR-74-53) Avail: NTIS CSCL 21/5

This report describes the results of an 8-month fuel control reliability test program to evaluate new dynamic fuel seals, ultrafine fuel filtration and the vibration susceptibility of the Chandler Evans TA-2S hydromechanical fuel control. Previous studies conducted under Army Contract DAAJ02-72-C-0110 identified these areas as potential generic design deficiencies in hydromechanical controls. (Modified author abstract) GRA

N75-11995# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
FIGHTER AIRCRAFT ENGINE DEPENDABILITY VERSUS RECONNAISSANCE AIRCRAFT ENGINE DEPENDABILITY WHEN BOTH AIRCRAFT USE THE SAME ENGINE M.S. Thesis
Anthony J. Pansza and Don F. Woods Aug. 1974 142 p refs
(AD-785444; SLSR-01-74B) Avail: NTIS CSCL 21/5

The technique currently used to forecast engine removals considers specific engine-aircraft combinations. If there is a significant difference in dependability of the same engine used in different aircraft it might be possible to redefine the engine-aircraft combination when forecasting and thus lower costs through a reduction or reallocation of the overall engine inventory. The F4 weapon system was selected as a study vehicle to analyze the effect of aircraft use or mission on engine dependability because the GE J79-15 engine is installed in different models of the F4 aircraft that are used for basically different purposes: reconnaissance and fighter-bomber missions. Engine failure data was obtained over an eight year period and statistically analyzed. (Modified author abstract) GRA

N75-11998# Hamilton Standard, Windsor Locks, Conn.
MULTIPLE FAULT GAS PATH ANALYSIS APPLIED TO TF30-P-408 ENGINE DATA Final Report
Joseph M. Kos Jun. 1974 130 p
(Contract N00140-74-C-0582)
(AD-785265; HSER-6587) Avail: NTIS CSCL 21/5

This report presents the results of a study made to demonstrate the validity and versatility of gas path analysis as applied to multiple fault gas turbine engine diagnostics. Actual engine test data at static and simulated Mach number conditions is used. From eleven diagnostic systems considered, the two best systems are presented as FORTRAN 4 subroutines for use by NAPTC. Results based on both empirical and theoretical considerations are presented. Author (GRA)

N75-11999*# Boeing Aerospace Co., Seattle, Wash.
FLIGHT CONTROL AND PROCEDURES FOR STIMULATED VISUAL APPROACH AND LANDING. SELF-PACED TRAINING PACKAGE
Verle E. Helsel and Thomas E. Sitterley Jan. 1974 104 p
(Contract NAS9-13550)
(NASA-CR-140335; D180-17875-1) Avail: NTIS HC $5.25 CSCL 14B

Experimental flight control and precedures training material is presented as a self-paced static training method. Cockpit familiarization, emergency procedures training, flight training, and a self-test are included. Author

N75-12001*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SIMULATION OF FLIGHT TEST CONDITIONS IN THE LANGLEY PILOT TRANSONIC CRYOGENIC TUNNEL
Robert A. Kilgore, Jerry B. Adcock, and Edward J. Ray Washington Dec. 1974 24 p refs
(NASA-TN-D-7811; L-9850) Avail: NTIS HC $3.25 CSCL 14B

The theory and advantages of the cryogenic tunnel concept are briefly reviewed. The unique ability to vary temperature independently of pressure and Mach number allows, in addition to large reductions in model loads and tunnel power, the independent determination of Reynolds number, Mach number, and aeroelastic effects on the aerodynamic characteristics of the model. Various combinations of Reynolds number and dynamic pressure are established to represent accurately flight variations of aeroelastic deformation with altitude changes. The consequences of the thermal and caloric imperfections of the test gas under cryogenic conditions were examined and found to be insignificant for operating pressures up to 5 atm. The characteristics of the Langley pilot transonic cryogenic tunnel are described and the results of initial tunnel operation are presented. Tests of a two-dimensional airfoil at a Mach number of 0.85 show identical pressure distributions for a chord Reynolds number of 8,600,000 obtained first at a stagnation pressure of 4.91 atm at a stagnation temperature of 322.0 K and then at a stagnation pressure of 1.19 atm at a stagnation temperature of 116.5 K. Author

N75-12003*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ANALYSIS AND COMPENSATION OF AN AIRCRAFT SIMULATOR CONTROL LOADING SYSTEM WITH COMPLIANT LINKAGE
Paul R. Johnson (Iowa State Univ. of Science and Technology, Ames) and Richard E. Bardusch Washington Dec. 1974 31 p refs
(NASA-TN-D-7747; L-9642) Avail: NTIS HC $3.25 CSCL 14B

A hydraulic control loading system for aircraft simulation was analyzed to find the causes of undesirable low frequency oscillations and loading effects in the output. The hypothesis of mechanical compliance in the control linkage was substantiated by comparing the behavior of a mathematical model of the system with previously obtained experimental data. A compensation scheme based on the minimum integral of the squared difference between desired and actual output was shown to be effective in reducing the undesirable output effects. The structure of the proposed compensation was computed by use of a dynamic programing algorithm and a linear state space model of the fixed elements in the system. Author

N75-12004# Mitre Corp., Bedford, Mass.
CONSIDERATION OF NEAR FIELD EFFECTS IN MICROWAVE LANDING SYSTEM (MLS) FEASIBILITY EVALUATION
H. S. Marsh Jul. 1974 35 p
(Contract F19628-73-C-0001; AF Proj. 6430)
(AD-784854; MTR-2808; ESD-TR-74-184) Avail: NTIS CSCL 17/7

The near field MLS beam pattern may be troublesome if C-band flare guidance is used. One of the complications is introduced by defocusing or broadening of the beam received by an aircraft located in the near field of the antenna. With a C-band flare elevation subsystem, the antenna near field will extend a distance from the antenna sufficient to contain the aircraft during flare and touchdown, and so the precise characteristics of the near field signals must be understood. The effects of beam broadening on system accuracy and signal processing requirements are briefly examined, and experimental investigations are recommended. A short discussion of antenna aperture optimization is also presented, and parallels are drawn between Doppler MLS and synthetic aperture radar. Author (GRA)

N75-12005# Avcon Universal Consultants Corp., Baden, Pa.
DEVELOPMENT OF MICROWAVE LANDING SYSTEM IMPLEMENTATION CRITERIA Final Report
Thomas L. Croswell Jul. 1974 50 p Sponsored by FAA
(AD-785220; AV-MLS-74-1; FAA-RD-74-121) Avail: NTIS CSCL 17/7

The study derives guidelines for MLS implementation planning from basic safety requirements for landing systems, from contemporary qualification criteria and from existing system status. A quantitative method is developed to facilitate evaluation of alternative MLS implementation plans, based on the conclusion that instrument approaches to ILS and MLS represent an increase in safety over approaches made to non-precision facilities. Substantiation of this conclusion, validation of the method, projection of instrument approaches and other steps leading to a detailed MLS implementation schedule are defined and their accomplishment recommended. Author (GRA)

N75-12009# Ohio Univ., Athens. Dept. of Electrical Engineering.
INSTRUMENT LANDING SYSTEM IMPROVEMENT PROGRAM: ENVIRONMENTAL STUDY OF THE 200 FOOT APERTURE SLOTTED CABLE LOCALIZER ANTENNA ARRAY Interim Report
William E. Kennedy and Richard H. McFarland Apr. 1974 23 p refs
(Contract DOT-FA69WA-2066)
(AD-785025; EER-5-19; FAA-RD-74-94) Avail: NTIS CSCL 17/7

Results of an experimental program to determine the operational stability of the 200 ft. aperture course array of the Watts Prototype Company's slotted cable localizer array are presented. Particular attention is given to those times when snow, ice, wind, and thunderstorms existed. Maximum course deviations of 2 microamperes were found with the far-field and integral course monitor. Generally the course held within 1 microampere and the width 2 microamperes. Author (GRA)

N75-12034*# Chrysler Corp., New Orleans, La. Space Div.
EFFECTS OF AIR BREATHING ENGINE PLUMES ON SSV ORBITER SUBSONIC WING PRESSURE DISTRIBUTION (OA57B), VOLUME 1
T. Soard (Rockwell Intern. Corp., Los Angeles) Oct. 1974 552 p 2 Vol.
(Contract NAS9-13247)
(NASA-CR-134416; DMS-DR-2080-Vol-1) Avail: NTIS HC $13.00 CSCL 22B

Data were obtained during wind tunnel tests of a 0.0405-scale model of the ferry configuration of the space shuttle vehicle orbiter conducted in a low speed wind tunnel during the time period of September 18 to September 23, 1973. The primary test objective was to investigate orbiter wing pressure distributions resulting from nacelle plumes above and below the wing. Three six-engine nacelle configurations were tested. One configuration had a twin-podded nacelle mounted above each wing and the others had one mounted below each wing. Both had a centerline twin-podded nacelle mounted below the wing. Wing pressure distribution was determined by locating static pressure bugs on the upper and lower surfaces of the left wing. Pressure bugs were also located on the upper and lower surfaces of the body flap and on the B12 afterbody fairing when it was installed. Base and balance cavity pressures were recorded and a strain gage instrumented beam in the right wing measured elevon hinge moments and normal forces. Author

N75-12035*# Chrysler Corp., New Orleans, La. Space Div.
EFFECTS OF WING/ELEVON GAP SEALING FLAPPER DOORS ON ORBITER ELEVON EFFECTIVENESS OF MODEL 16-0 IN THE NAAL 7.75 BY 11 FOOT CONTINUOUS FLOW WIND TUNNEL (OA119A)
R. Mennell (Rockwell Intern., Los Angeles) Oct. 1974 288 p
(Contract NAS9-13247)
(NASA-CR-134421; DMS-DR-2187) Avail: NTIS HC $8.75 CSCL 22B

Space shuttle orbiter elevon effectiveness was measured with the 6 inch elevon/elevon and elevon/fuselage gaps and various configurations of wing/elevon upper hingeline gap sealing flapper doors. The elevon configuration parametric variations consisted of sealing the lower hingeline to prevent flow-through and testing a long chord flapper door, a short chord flapper door, no flapper door (elevon/wing gap upper hingeline completely open), and a completely sealed elevon at elevon deflections from +20 deg to -40 deg. Preliminary data analysis indicates loss of elevon effectiveness at deflections more negative than -20 deg, and little or no effect of flapper door configuration on elevon effectiveness. Flow visualization photographs taken at alpha = 15 deg for two flapper door configurations substantiated the force data results. Aerodynamic force and moment data were measured in the body axis by a 2.5 inch task type internal strain gage balance. The model was sting supported through the base region with a nominal angle of attack range of -10 deg less than or equal to alpha less than or equal to 24 deg at a model angle of sideslip of Beta equal to 0 deg. Author

N75-12040*# Chrysler Corp., New Orleans, La. Space Div.
EFFECTS OF THE AIR BREATHING ENGINE PLUMES ON SSV ORBITER SUBSONIC WING PRESSURE DISTRIBUTIONS (OA57A)
Bruce W. Cameron, Jr. (Rockwell Intern., Los Angeles) Oct. 1974 706 p
(Contract NAS9-13247)
(NASA-CR-134414; DMS-DR-2074) Avail: NTIS HC $17.25 CSCL 22B

Experimental aerodynamic pressure investigations were conducted on a 0.0405 scale representation of the -89 space shuttle orbiter ferry configuration in the Rockwell International 7.75 x 11.00 foot Low Speed Wind Tunnel. The primary test objective was to investigate the orbiter wing pressure distribution resulting from five under-wing engine nacelle plumes. Two five engine nacelle configurations were tested at 3 ground plane heights with pressure bug measurements being made on the left upper and lower wing panel. In addition, base and balance cavity pressure measurements were made, with elevon normal and hinge moment measurements on the right panel. Author

N75-12056# Douglas Aircraft Co., Inc., Long Beach, Calif.
THE MARK 4 SUPERSONIC-HYPERSONIC ARBITRARY BODY PROGRAM. VOLUME 1: USER'S MANUAL Final Report
Arvel E. Gentry, Douglas N. Smyth, and Wayne R. Oliver Nov. 1973 270 p refs
(Contract F33615-72-C-1675)
(AD-778443; AFFDL-TR-73-159-Vol-1) Avail: NTIS CSCL 22/3

The report describes a digital computer program system that is capable of calculating the supersonic and hypersonic aerodynamic characteristics of complex arbitrary three-dimensional shapes. This program is identified as the Mark IV Supersonic-Hypersonic Arbitrary-Body Computer Program. This program is a complete reorganization and expansion of the old Mark III Hypersonic Arbitrary-Body Program. The Mark IV program has a number of new capabilities that extend its applicability down into the supersonic speed range. (Modified author abstract) GRA

N75-12057# Douglas Aircraft Co., Inc., Long Beach, Calif.
THE MARK 4 SUPERSONIC-HYPERSONIC ARBITRARY BODY PROGRAM. VOLUME 3: PROGRAM LISTINGS Final Report
Arvel E. Gentry, Douglas N. Smyth, and Wayne R. Oliver Nov. 1973 583 p
(Contract F33615-72-C-1675)
(AD-778445; AFFDL-TR-73-159-Vol-3) Avail: NTIS CSCL 22/3

The volume contains the source language listings of the Mark IV Supersonic-Hypersonic Arbitrary-Body Program (Mod 0 Version). The program as shown in this listing will operate on CDC 6500, 6600, and CYBER 74 computers. With a small converter program, the Mark IV program can be converted for operation on IBM 360 and 370 types of computers. This converter program is included with the listings. GRA

N75-12077*# Pratt and Whitney Aircraft, East Hartford, Conn.
IMPACT RESISTANCE OF HYBRID COMPOSITE FAN BLADE MATERIALS
L. A. Friedrich May 1974 54 p refs
(Contract NAS3-17789)
(NASA-CR-134712; PWA-TM-5022) Avail: NTIS HC $4.25 CSCL 11D

Improved resistance to foreign object damage was demonstrated for hybrid composite simulated blade specimens. Transply metallic reinforcement offered additional improvement in resistance to gelatin projectile impacts. Metallic leading edge protection permitted equivalent-to-titanium performance of the hybrid composite simulated blade specimen for impacts with 1.27 cm and 2.54 cm (0.50 and 1.00 inch) diameter gelatin spheres. Author

N75-12082# Whittaker Corp., San Diego, Calif. Research and Development Div.
MANUFACTURING METHODS TECHNOLOGY (MM AND T) FOR BALLISTICALLY TOLERANT REPLACEMENT FLIGHT CONTROL COMPONENTS Final Report, May 1972 - Feb. 1974
Rune Anderson Jul. 1974 74 p refs
(Contract DAAJ02-72-C-0115)
(AD-785582; MJO-4409; USAAMRDL-TR-74-59) Avail: NTIS CSCL 13/8

The objective of this program was to develop manufacturing methods and technology for producing glass reinforced plastic, ballistically tolerant flight control components with a high degree

of reliability while utilizing low-cost fabrication techniques. This objective was achieved through development of component designs to obtain simplicity and ease of manufacture. Maximum use was made of commercially available, finished material forms which required a minimum of additional processing. Matched die molding processes were developed which allowed rapid manufacture of parts to final net dimensions. Assembly techniques were developed which utilized adhesive bonding in precision fixtures and allowed a high degree of reproducibility and reliability of the finished component. (Modified author abstract) GRA

N75-12123# Royal Aircraft Establishment, Farnborough (England).
HEAT RESISTANT TITANIUM ALLOYS. INTRODUCTION OF THE ALLOY UT 651A
L. Seraphin, R. Tricot, and R. Castro Oct. 1974 35 p refs Transl. into ENGLISH from Rev. Met. (Paris), v. 71, no. 1, 1974 p 19-36
(RAE-Lib-Trans-1790; BR44153) Avail: NTIS HC $3.75

After the metallurgical data specific to the heat resistant titanium alloys are reviewed, the essential design criteria which govern their use in aircraft jet engines are presented. The main properties of a new alloy derived from 685, but having an improved quenchability, are given and compared with those of the original. The properties are such that the use of the materials for compressor disk can be considered. The alloy has the required properties in sections up to about 40mm thick after air quenching, and up to about 60mm after oil quenching. Author

N75-12147# Defence Standards Labs., Maribyrnong (Australia).
THE PAINTING OF MILITARY AIRCRAFT
L. A. Hill and F. Marson Aug. 1974 14 p
(DSL-TN-345) Avail: NTIS HC $3.25

The requirements of the coating system of a modern military aircraft are outlined, the surface to be protected are detailed and methods of surface pretreatment discussed. Corrosion problems are indicated. The types of paint used on aircraft and the appropriate specifications are considered. Local problems of refinishing are discussed. Author

N75-12195*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DEPLOY/RELEASE SYSTEM Patent Application
David B. Robelen, inventor (to NASA) Filed 27 Nov. 1974 12 p
(NASA-Case-LAR-11575-1; US-Patent-Appl-SN-527727) Avail: NTIS HC $3.25 CSCL 09C

An apparatus is described for arresting uncontrollable motions of model aircraft. A remotely transmitted signal is used to deploy a parachute and after the model aircraft motions are stabilized, a second signal is transmitted which jettisons the parachute and normal flight resumed. The deploy and jettison signals may be sent using a single channel of a multi-channel transmitter and are completely independent of each other. NASA

N75-12196# Royal Aircraft Establishment, Farnborough (England).
CONTROL OF A TRANSISTOR SWITCH BY CURRENT TRANSFORMER
H. Cammas, J. C. Marpinard, R. Prajoux, and Y. Quemener Jun. 1974 17 p refs Transl. into ENGLISH from paper read at the LAAS Conf. on Elec. Propulsion in its Space Appl., Toulouse, 1972
(RAE-Lib-Trans-1774; BR42366) Avail: NTIS

The regulation devices used in flight power conditioning systems, particularly those required for electric thruster supplies usually work by switching to increase their efficiency and reduce their mass. The switching component is usually a transistor working as a switch. A transistor switch control system will be described using a current transformer and it will be shown that it offers particular advantages notably for flight uses. Indeed the reduction of the mass of flight regulators requires an increase in operating frequency of the switching devices which places extra constraints on the control of switches if an efficiency penalty is not desired and if a reliability consistent with the proposed mission life for communication satellites is to be achieved. Author

N75-12338# Curtiss-Wright Corp., Wood-Ridge, N.J.
DESIGN AND DEVELOPMENT TESTING OF FREE PLANET TRANSMISSION CONCEPT Final Report, 26 Jun. 1972 - 31 Dec. 1973
Neil A. DeBruyne Apr. 1974 90 p refs
(Contract DAAJ02-72-C-0113)
(AD-782857/7; CW-WR-73-040; USAAMRDL-TR-74-27) Avail: NTIS HC $4.75 CSCL 01/3

An experimental program to demonstrate and evaluate the Curtiss-Wright free planet concept for power transmission. The program consisted of designing a 500-horsepower speed reducer to operate at 8000 rpm input speed and 19.2425 reduction ratio. This design was procured and evaluated. The evaluation consisted of static and dynamic evaluations as well as 50 hours of endurance testing at rated operating conditions. (Modified author abstract) GRA

N75-12362 Bell Aerosystems Co., Buffalo, N.Y. Structural Systems Dept.
A DISCRETIZED PROGRAM FOR THE OPTIMAL DESIGN OF COMPLEX STRUCTURES
James R. Batt and Ronald A. Gellatly *In* AGARD Structural Optimization Sep. 1974 15 p refs

More economical and more flexible procedures for structural optimization of large scale systems have been sought. A new approach to determine the minimum weight of such systems has been developed, is discrete in nature, and is labeled the sieve-search technique. An essential element of the technique is the use of data banks which contain minimum weight and associated geometry of structural components. These banks are generated using classical methods of optimization. An additional facet of the technique is the use of simplified engineering analysis methods during the redesign phase of the optimization cycle. Herein lies the efficiency of the sieve-search technique. The method was successfully applied to the design of an extensive class of surface effect vehicles and is shown through application to the design of thermal protective systems and associated wing substructure. Author

N75-12376# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STRUCTURAL MECHANICS OF SKEWED THIN WALL SYSTEMS
I. P. Breztsov and G. G. Onanov 19 Jul. 1974 813 p refs Transl. into ENGLISH of the book "Stroitelnaya Mekhanika Skoshennykh Tonkostennykh Sistem' USSR, 1973 p 1-659
(AD-785116; FTD-HC-23-1297-74) Avail: NTIS CSCL 20/11

The general subject of the report is a reinforced conical swept, low-aspect, delta, etc.) and different types of airframes. The Lagrange variational principle is used to develop a general method of calculation of a reinforced conical shell of arbitrary configuration, amounting to the integration of a system of ordinary differential equations describing the operation of oblique thin-walled systems when the form of external actions is arbitrary. GRA

N75-12769# Naval Air Development Center, Warminster, Pa.
SPECIFICATION FOR VISUAL TARGET ACQUISITION SYSTEM AN/AVG-8A (XJ-1) FLIGHT TEST PROGRAM INTERFACE CONTROL DOCUMENT SH 4506-02-73
5 Oct. 1973 83 p refs
(AD-779909) Avail: NTIS CSCL 19/5

The document establishes and controls the specific technical criteria for the installation of the AVG-8A Visual Target Acquisition System (VTAS) into the F-14A weapon system on aircraft Buno. TBD. The items covered are limited to those where control of the interface is necessary for the aircraft contractor, the F-14A weapon control system contractor and the AVG-8A contractor to perform their respective tasks. GRA

N75-12890# Research Inst. of National Defence, Stockholm (Sweden).
LYSTER: AIR DEFENCE SURFACE PROTECTION CAPABILITY IN SWEDISH TERRAIN [LYSTER: LUFTVAERNETS YTTAECKNINGSFOERMAGA I SVENSK TERRAENG]
Bjoern Eriksson and Erland Tarras-Wahlberg Jan. 1973 92 p In SWEDISH
(FOA-P-C-8349-M1) Avail: NTIS HC $4.75

LYSTER is a stochastic computer model for calculating the effectiveness of the air defense unit against hostile air units. The model is specially adapted for studying the results against low flying attack aircraft. The following influencing factors are therefore considered with special care: The terrain, antiaircraft gun units, technical obligations and tactics, the aircraft units, technical obligations and tactics, optical aiming, electronic and other countermeasures. Author.

N75-12891# Army Armament Command, Rock Island, Ill. Systems Analysis Office.
ANALYSIS OF DELIVERY ACCURACY FOR AH-1G (COBRA) LAUNCHED 2.75-INCH ROCKETS FROM TESTS CONDUCTED JANUARY - MARCH 1972 AT CHINA LAKE, CALIFORNIA Technical Report, Jun. - Aug. 1973
Walter J. Baumen, Jr. May 1974 30 p refs
(AD-782978; SAO-3) Avail: NTIS CSCL 05/9

The accuracy of the AH-1G (COBRA)/2.75 inch rocket system was determined. Results are -9.4 mils in pitch, 9.3 mils in deflections for pass-to-pass variable bias. The values 9.1 mils(at 3000 meters) to 20.6 mils (at 1300 meters) in pitch, and 9.9 mils in deflection apply to ripple-to-ripple variable bias. For round-to-round error, the values 7.6 to 10.0 mils in pitch and 8.7 to 11.3 mils in deflection are given. These values are given for the attack slant ranges between 1300 and 3000 meters. They are for experienced pilots. The effect of experience on accuracy of pilots is given for this rocket system. Author (GRA)

N75-12894 Massachusetts Univ., Amherst.
A METHOD FOR DETERMINING THE EFFECTS OF RAPID INFLOW CHANGES ON THE DYNAMICS OF AN AUTOROTATING ROTOR Ph.D. Thesis
Eugene Everett Niemi, Jr. 1974 199 p
Avail: Univ. Microfilms Order No. 74-25931

The equations of motion are derived for the blade flapping that occurs when a helicopter or gyroplane rotor is operating in autorotation. These equations account for wide variations in rotor rpm and a pitching rotor shaft. The equations are programmed for numerical solution with a digital computer. The validity of the equations is demonstrated by numerous comparisons of the theory with published experimental data for rotor blade flapping motion and angular velocity variations. Experiments are described in which a 3 ft. diameter rotor model was tested in autorotation in a wind tunnel. The equations are used to predict the rotor blade flapping motion and autorotation rpm that occur. The agreement between theory and experiments is found to be generally fair to good. Dissert. Abstr.

N75-12895 Pennsylvania State Univ., University Park.
THE VORTEX LATTICE METHOD FOR THE ROTOR-VORTEX INTERACTION PROBLEM Ph.D. Thesis
Raghuveera Padakannaya 1973 141 p
Avail: Univ. Microfilms Order No. 74-20956

The rotor blade-vortex interaction problem and the resulting impulsive airloads which generate undesirable noise levels are dealt with. A numerical lifting surface method to predict unsteady aerodynamic forces induced on a finite aspect ratio rectangular wing by a straight, free vortex placed at an arbitrary angle in a subsonic incompressible free stream is developed first. In this vortex lattice method both the spanwise and the chordwise loadings are made stepwise discontinuous. Unsteady airloads on the wing are obtained by starting the system from rest. Using a rigid wake assumption, the wake vortices are assumed to move downstream with the free stream velocity. Unsteady load distributions are obtained which compare favorably with the results of planar lifting surface theory. The vortex lattice method was extended to a single bladed rotor operating at high advance ratios and encountering a free vortex from a fixed wing upstream of the rotor. Dissert. Abstr.

N75-12896*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MEASUREMENTS OF THE VORTEX WAKES OF A SUBSONIC AND SUPERSONIC TRANSPORT MODEL IN THE 40 BY 80 FOOT WIND TUNNEL
V. J. Rossow, V. R. Corsiglia, and J. J. Phillippe (ONERA) Sep. 1974 19 p refs
(NASA-TM-X-62391) Avail: NTIS HC $3.25 CSCL 01B

The rolling moment induced on aircraft models in the wake of a model of a subsonic transport and of a supersonic transport was measured as a function of angle of attack for several configurations. The tests are described and an analysis of the data is given in this memorandum. Author

N75-12898*# Kansas Univ., Lawrence. Flight Research Lab.
AN ANALYTICAL INVESTIGATION OF WING-JET INTERACTION
C. Edward Lan [1974] 158 p refs
(Grant NGR-17-002-107)
(NASA-CR-138140; CRINC-FRL-74-001) Avail: NTIS HC $6.25 CSCL 01B

The aerodynamic interaction between the wing and an inviscid jet with Mach number nonuniformity is formulated by using a two-vortex-sheet model for the jet. One of the vortex sheets accounts for the induced jet flow and the other the induced outer flow. No additional source distribution is needed for the jet at an angle of attack. The above problem is solved by satisfying the jet and wing tangency and the jet pressure-continuity conditions and using a quasi vortex lattice method for computing the induced flow field. The latter method is derived through theoretical consideration by properly accounting for singularities present in the equations and possesses the same simplicity and generality as the conventional vortex lattice method but has a better rate of numerical convergence. The resulting system of algebraic equations is solved by Purcell's vector method. The numerical formulation is first applied to the wing-slipstream interaction problem. Results for one centered-jet configuration are compared with those predicted by some existing theories. Author

N75-12899*# Tennessee Univ. Space Inst., Tullahoma.
NUMERICAL SOLUTION FOR UNSTEADY SONIC FLOW OVER THIN WINGS Final Report
K. R. Kimble and J. M. Wu Aug. 1974 35 p refs
(Grant NGR-43-001-102)
(NASA-CR-141114) Avail: NTIS HC $3.75 CSCL 01B

A numerical solution precedure of a simplified unsteady transonic equation which is fast, reasonably accurate, and takes into account many of the effects of the steady flow field is described. The numeric solution of this equation is accurate and is accomplished on an IBM 360/65 computer. Arbitrary planform shape is accommodated and variable local Mach number effects from the steady flow are easily handled. Author

N75-12901*# Kanner (Leo) Associates, Redwood City, Calif.
INVESTIGATION OF THE INFLUENCE OF VORTEX GENERATORS ON TURBULENT BOUNDARY LAYER SEPARATION
V. M. Gadetskiy, Ya. M. Serebriyskiy, and V. M. Fomin Washington NASA Dec. 1974 10 p refs Transl. into ENGLISH from Uch. Zap. (USSR), v. 3, no. 4, 1972 p 22-28
(Contract NASw-2481)
(NASA-TT-F-16056) Avail: NTIS HC $3.25 CSCL 01B

The influence of a parallel system and a diffusor type system of vortex generators on the position of the shock waves on the airfoil profile is studied experimentally. A parallel system of vortex generators is mounted at an angle of 20 deg to the oncoming flow and a system of diffusors is mounted pairwise on the airfoil. Data showing the superiority of the parallel system over the diffusor system are presented. Author

N75-12902*# Scientific Translation Service, Santa Barbara, Calif.
FLIGHT TESTS IN THE WIND TUNNEL FOR THE DEVELOPMENT AND TESTING OF A GUST ALLEVIATION SYSTEM
Bernd Krag and Henning Subke Washington NASA 23 Dec. 1974 10 p ref Transl. into ENGLISH from the German report
(Contract NASw-2483)
(NASA-TT-F-16079) Avail: NTIS HC $3.25 CSCL 01B

The development and characteristics of a free flight, elastic controlled configured vehicle (CCV) wind tunnel model are discussed. The CCV model is used to determine aircraft responses and controller responses to gust simulations. The model represents a compromise between computer simulation and actual flight tests. The advantages of the procedure are analyzed. Author

N75-12903*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
HELICOPTER ROTOR ROTATIONAL NOISE PREDICTIONS BASED ON MEASURED HIGH-FREQUENCY BLADE LOADS
Robert N. Hosier (Army Air Mobility R and D Lab., Hampton, Va.) and Ramani Ramakrishnan (George Washington Univ.) Washington Dec. 1974 86 p refs
(NASA-TN-D-7624; L-9358) Avail: NTIS HC $4.75 CSCL 01B

In tests conducted at the Langley helicopter rotor test facility, simultaneous measurements of up to 200 harmonics of the fluctuating aerodynamic blade surface pressures and far-field radiated noise were made on a full-scale nontranslating rotor system. After their characteristics were determined, the measured blade surface pressures were converted to loading coefficients and used in an existing theory to predict the far-field rotational noise. A comparison of the calculated and measured noise shows generally good agreement up to 300 to 600 Hz, depending on the discreteness of the loading spectrum. Specific attention is given to the effects of the blade loading coefficients, chordwise loading distributions, blade loading phases, and observer azimuthal position on the calculations. Author

N75-12904*# Boeing Vertol Co., Philadelphia, Pa.
INVESTIGATION OF ROTOR BLADE ELEMENT AIRLOADS FOR A TEETERING ROTOR IN THE BLADE STALL REGIME
L. U. Dadone and T. Fukushima Sep. 1974 113 p refs Sponsored in part by Army Air Mobility R and D Lab., Moffett Field, Calif.
(Contract NAS2-7229)
(NASA-CR-137534; D210-10792-1) Avail: NTIS HC $5.25 CSCL 01B

A model of a teetering rotor was tested in a low speed wind tunnel. Blade element airloads measured on an articulated model rotor were compared with the teetering rotor and showed that the teetering rotor is subjected to less extensive flow separation. Retreating blade stall was studied. Results show that stall, under the influence of unsteady aerodynamic effects, consists of four separate stall events, each associated with a vortex shed from the leading edge and sweeping over the upper surface of the rotor blade. Current rotor performance prediction methodology was evaluated through computer simulation. Author

N75-12905*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EXPERIMENTAL STUDY OF THE EFFECTIVENESS OF CYLINDRICAL PLUME SIMULATORS FOR PREDICTING JET-ON BOATTAIL DRAG AT MACH NUMBERS UP TO 1.30
David E. Reubush Washington Nov. 1974 158 p refs
(NASA-TN-D-7795; L-9746) Avail: NTIS HC $6.25 CSCL 01B

An investigation has been conducted in a 16-foot transonic tunnel to determine the effectiveness of utilizing solid circular cylinders to simulate the jet exhaust plume for a series of eight nacelle-mounted isolated circular-arc afterbodies. This investigation was conducted at Mach numbers from 0.40 to 1.30 at an angle of attack of 0. Plume simulators with simulator diameter to nozzle-exit diameter ratios of 0.82, 0.88, 0.98, and 1.00 were investigated. Results of this investigation indicate that use of one of the larger diameter simulators at all Mach numbers would generally result in pressure-coefficient distributions and drag coefficients useful for preliminary design work. Author

N75-12906*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
APPLICATION OF A PARAMETER IDENTIFICATION TECHNIQUE TO A HINGELESS HELICOPTER ROTOR
Gerd Kanning and James C. Biggers Washington Dec. 1974 68 p refs
(NASA-TN-D-7834; A-5289) Avail: NTIS HC $4.25 CSCL 01B

A mathematical model of a gyro-controlled, three-bladed hingeless helicopter rotor was developed and parameters of the model were estimated using a parameter identification technique. The flapping and feathering degrees of freedom of the blades were modeled. The equations of the model contain time-varying, periodic coefficients due to the forward speed of the rotor. A digital simulation of the analytical model was compared with wind-tunnel measurements to establish the validity of the model. Comparisons of steady-state and transient solutions of the analytical model with the tunnel measurements gave reasonably good matching of gyro angle but less satisfactory matching of hub moment measurements. Further improvements were obtained by use of a parameter identification technique to adjust as many as 10 parameters of the analytical model. The sensitivity of the blade response to small changes in the parameters was also calculated. Author

N75-12907# United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft Div.
THE 3000-HP ROLLER GEAR TRANSMISSION DEVELOPMENT PROGRAM. VOLUME 4: LABORATORY BENCH TEST Final Report
G. F. Gardner and R. E. Haven May 1974 433 p
(Contract DAAJ02-69-C-0042; DA Proj. 1G1-62203-D-144)
(AD-785575; SER-611622-Vol-4; USAAMRDL-TR-73-98D)
Avail: NTIS CSCL 01/3

The report presents the results of dynamic load tests performed on a turbine powered helicopter transmission which incorporates a roller gear drive unit as the main reduction stage. The primary purpose of this program was to conduct a 200-hour endurance test at 100% design speed and at a load spectrum equivalent to military helicopter usage. (Modified author abstract) GRA

N75-12909# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
INVESTIGATION INTO THE FORMATION OF WING-TIP VORTICES Interim Report
J. Rom, H. Portnoy, and C. Zorea Feb. 1974 44 p refs
(Grant AF-AFOSR-2145-71; AF Proj. 9781)
(AD-783271; TAE-199; AFOSR-74-1288TR; SR-2) Avail: NTIS CSCL 01/1

A resume of the program of theoretical investigations into wing-tip vortex formation which is now in progress in the Department of Aeronautical Engineering at the Technion, Haifa, is given. The work is proceeding along two separate paths which it is hoped eventually to amalgamate. The first investigation consists of numerical work on the rolling up of the wing trailing vortex system when it is represented by discrete vortices according to a series of models of increasing complexity starting from the two-dimensional elliptic distribution as originally treated by Westwater and proceeding by stages through various lifting-line and lifting-surface models, including some exhibiting non-linear lift characteristics. The second project is a detailed investigation of the flow field near wing tips and wake edges, including thickness effects. It is felt that the precise flow field near wing tips and the wake edges must be understood if the rolling up and structure of the trailing-vortex cores is to be properly studied.
Author (GRA)

N75-12910# International Civil Aviation Organization, Montreal (Quebec).
ACCIDENT INVESTIGATION AND PREVENTION DIVISIONAL MEETING
24 Jun. 1974 95 p Meeting held at Montreal, 3-24 Jun. 1974
(Doc-9106-AIG(1974)) Avail: NTIS HC $4.75

Various aspects of aircraft accident investigation are summarized including accident reports, inquiries, investigation techniques, and financial viewpoints. The role of flight recorders is discussed. The procedures for handling radioactive materials after a crash are enumerated. Rules and regulations for investigating U.S. aircraft that have crashed on foreign territories are also considered. J.A.M.

N75-12912*# Scientific Translation Service, Santa Barbara, Calif.
AIR TRANSPORTATION: GOOD AND BAD USES
M. Wolkowitsch Washington NASA 17 Dec. 1974 19 p Transl. into ENGLISH from Rev. Gen.de l'Air et de l'Espace (France), v. 37, no. 1, 1974 p 7-17
(Contract NASw-2483)
(NASA-TT-F-16067) Avail: NTIS HC $3.25 CSCL 05C

Air transportation and its growth problems were studied. It was recommended that: (1) plans for expanding air services to remoter regions and for short haul purposes be reconsidered; (2) the quality of air service for those routes where its advantages over other means of transport are undeniable be improved, and (3) the proliferation of air service be restrained where its existence is not absolutely necessary and where the development or improvement of rail transportation, for example, would be more sane and economical. Author

N75-12914# Sandia Labs., Albuquerque, N.Mex.
QUANTITATIVE CHARACTERIZATION OF THE ENVIRONMENT EXPERIENCED BY CARGO IN AIRCRAFT ACCIDENTS
R. K. Clarke, J. T. Foley, W. F. Hartman, and D. W. Larson [1974] 7 p refs Presented at 4th Intern. Symp. on Packaging and Transportation of Radioact. Materials, Miami Beach, Fla., 22 Sep. 1974 Sponsored by AEC
(SLA-74-5372; Conf-740901-8) Avail: NTIS HC $3.25

Relative to surface transportation modes, the frequency of occurrence of cargo aircraft accidents is about two orders of magnitude less on a mileage basis. These accidents tend to be much more severe when they do occur, however, and the purpose of the study is to determine how frequently the environments of the various severities can be expected. The type of environments, the parameters used to describe the several environments, and the general analytical method employed to arrive at these descriptions are those described in the previous paper.
Author (NSA)

N75-12915#. National Transportation Safety Board, Washington, D.C. Bureau of Aviation Safety.
AIRCRAFT ACCIDENT REPORT. TRANS WORLD AIRLINES, INC., BOEING 707-331B, N8705T, LOS ANGELES, CALIFORNIA, 28 AUGUST 1973
10 Jul. 1974 48 p
(PB-234422/4; NTSB-AAR-74-8) Avail: NTIS HC $3.75

A Trans World Airlines, Inc., Boeing 707-331B porpoised while descending approximately 35 miles west of Los Angeles, California, at 2150 p.d.t. on August 28, 1973. The flight was bound for the Los Angeles International Airport. The longitudinal instability persisted for about 2 minutes during which more than 50 pitch oscillations occurred. Peak acceleration forces at +2.4g to minus 0.3g were measured at the aircraft's center of gravity. There were 141 passengers and 11 crewmembers aboard. As a result of the accident, one passenger was injured fatally; one flight attendant and two other passengers were injured seriously. The National Transportation Safety Board determined that the probable cause of this accident was a combination of design tolerances in the aircraft's longitudinal control system which, under certain conditions, produced a critical relationship between control forces and aircraft response. GRA

N75-12916# National Transportation Safety Board, Washington, D.C. Bureau of Aviation Safety.
AIRCRAFT ACCIDENT REPORT: NATIONAL AIRLINES, INCORPORATED, McDONNELL-DOUGLAS DC-10-10, N60NA, NEAR TAMPA, FLORIDA, 8 JULY 1974 Aircraft Accident Report
22 Jul. 1974 10 p
(PB-234791/2; NTSB-AAR-74-9) Avail: NTIS HC $3.25 CSCL 01B

About 0940 e.d.t. on July 8, 1974, cowling from the aft section of the No. 1 engine of National Airlines, Inc., Flight 41, separated from the aircraft during climbout from Miami International Airport, Miami, Florida. The cowling tore large holes in the left wing leading edge and in the upper wing surface before being ingested into the No. 2 engine. The flightcrew made an immediate emergency landing at Tampa International Airport, Tampa, Florida, without further difficulty. There were no injuries. The National Transportation Safety Board determined that the probable cause of the accident was the failure of company maintenance personnel to complete the installation of mounting bolts on the inboard panel of the No. 1 engine core cowl. GRA

N75-12928# Autonetics, Anaheim, Calif.
CONCEPT FOR A SATELLITE-BASED ADVANCED AIR TRAFFIC MANAGEMENT SYSTEM. VOLUME 3: OPERATIONAL LOGIC FLOW DIAGRAMS FOR A GENERIC ADVANCED AIR TRAFFIC MANAGEMENT SYSTEM Final Report, Oct. 1972 - Oct. 1973
C. V. Hamilton, C. S. Hoffman, J. B. King, and R. J. Knight Feb. 1974 181 p
(Contract DOT-TSC-508)
(PB-234271/5; DOT-TSC-OST-73-29-8-Vol-3) Avail: NTIS HC $7.00 CSCL 17G

A description is presented of the services a generic advanced air traffic management system (AATMS) should provide to the users of the system to facilitate the safe, efficient flow of traffic. It provides a definition of the functions which the system must perform to provide these services and relates them to the various phases or segments of flight encountered in a general flight profile. A series of detailed operational logic flow diagrams, which specify individual tasks or activities which must be accomplished to complete each function, are also presented. These flow diagrams were generated as an aid in the development of a digital simulation of an AARMS. They are required as a basis for subsystem mechanization and for the analysis of system implementations. GRA

N75-12929# Mitre Corp., McLean, Va.
AN ADVANCED AIR TRAFFIC MANAGEMENT CONCEPT BASED ON EXTENSIONS OF THE UPGRADED THIRD GENERATION ATC SYSTEM. SYSTEM B: GENERAL REQUIREMENTS SPECIFICATION
R. M. Harris Feb. 1974 186 p refs
(Contract DOT-FA70WA-2448)
(AD-785264; MTR-6419-Ser-2; FAA-EM-73-10A-Ser-2) Avail: NTIS HC $5.50

A preliminary outline for a study of competing air traffic control systems for the 1990 era is presented. The ground rules for comparing two system approaches are given with emphasis on maintaining common assumptions with respect to air traffic demand, airport development, controller workload, automation levels, and the system elements already in place in 1982. A number of modifications were found to be necessary. Author

N75-12930* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
INTEGRATED LIFT/DRAG CONTROLLER FOR AIRCRAFT Patent
John W. Olcott (Aeronaut. Res. Assoc. of Princeton, Inc.), Edward Seckel (Aeronaut. Res. Assoc. of Princeton, Inc.), and David R. Ellis, inventors (to NASA) (Aeronaut. Res. Assoc. of Princeton, Inc.) Issued 26 Nov. 1974 11 p Filed 23 Mar. 1972 Supersedes N73-30938 (11 - 22, p 2613) Sponsored by NASA
(NASA-Case-ARC-10456-1; US-Patent-3,850,388;
US-Patent-Appl-SN-237491; US-Patent-Class-244-75R;
US-Patent-Class-74-480R; US-Patent-Class-244-83R;
US-Patent-Class-416-25) Avail: US Patent Office CSCL 01C

A system for altering the lift/drag characteristics of powered aircraft to provide a safe means of glide path control includes a control device integrated for coordination action with the aircraft throttle. Such lift/drag alteration devices as spoilers, dive brakes, and the like are actuated by manual operation of a single lever coupled with the throttle for integrating, blending or coordinating power control. Improper operation of the controller is inhibited by safety mechanisms. Official Gazette of the U.S. Patent Office

N75-12931 California Inst. of Tech., Pasadena.
THEORETICAL INVESTIGATION OF MINIMUM TIME LOOP MANEUVERS OF JET AIRCRAFT Ph.D. Thesis
Sachio Uehara 1974 93 p
Avail: Univ. Microfilms Order No. 74-24455

Minimum time loop maneuvers of high performance jet aircraft have been investigated by means of the calculus of variations. A number of simplifying assumptions have been made in the atmospheric conditions, aerodynamic parameters, and the number of controls and their upper and lower bounds, in order to obtain general features and basic characteristics of the problem. The optimal control (lift coefficient and thrust) has been determined as a function of the state variables and Lagrange multipliers. Possible transitions among the five optimal subarcs have been established by applying the corner conditions of variational calculus. These relationships are applicable to any minimum time maneuver in the vertical plane. The effects of the magnitudes of maximum lift coefficient and maximum thrust on the control program, maneuver time, final speed, and final horizontal distance for minimum time loop maneuvers are explored through numerical computation. It is found that the control history in lift and thrust and the minimum time required for a loop maneuver depend strongly on the magnitudes of maximum lift coefficient and maximum thrust. Dissert. Abstr.

N75-12932*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THE EFFECT OF CANARD LEADING EDGE SWEEP AND DIHEDRAL ANGLE ON THE LONGITUDINAL AND LATERAL AERODYNAMIC CHARACTERISTIC OF A CLOSE-COUPLED CANARD-WING CONFIGURATION
Blair B. Gloss Washington Dec. 1974 70 p refs
(NASA-TN-D-7814; L-9788) Avail: NTIS HC $4.25 CSCL 01C

A generalized wind-tunnel model, with canard and wing planforms typical of highly maneuverable aircraft, was tested in the Langley high-speed 7- by 10-foot tunnel at a Mach number of 0.30. The test was conducted in order to determine the effects of canard sweep and canard dihedral on canard-wing interference at high angles of attack. In general, the effect of canard sweep on lift is small up to an angle of attack of 16 deg. However, for angles of attack greater than 16 deg, an increase in the canard sweep results in an increase in lift developed by the canard when the canard is above or in the wing chord plane. This increased lift results in a lift increase for the total configuration for the canard above the wing chord plane. For the canard in the wing chord plane, the increased canard lift is partially lost by increased interference on the wing. Author

N75-12933*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SIMULATION STUDY OF INTRACITY HELICOPTER OPERATIONS UNDER INSTRUMENT CONDITIONS TO CATEGORY 1 MINIMUMS
William M. Callan, Jacob A. Houck, and Daniel J. DiCarlo Washington Dec. 1974 24 p refs
(NASA-TN-D-7786; L-9709) Avail: NTIS HC $3.25 CSCL 01B

A fixed-base simulator study was conducted to define pilot workload and task performance associated with instrument flight operations for an intracity helicopter passenger service. Displays considered necessary to provide a minimal capability under Instrument Flight Rules conditions were used to fly a representative commercial helicopter route structure in the New York area, with each terminal assumed to be equipped with a precision approach guidance system. A cross section of pilots participated as test subjects, and despite the high workload level, the results indicated that for the assumptions employed, minimums of 61 m (200 ft) ceiling and 805 m (0.5 mile) visibility were feasible. Author

N75-12934*# Northrop Corp., Hawthorne, Calif. Aircraft Div.
INVESTIGATION OF NORTHROP F-5A WING BUFFET INTENSITY IN TRANSONIC FLIGHT
Hwang Chintsun and W. S. Pi Washington NASA Nov. 1974 186 p refs
(Contract NAS2-6475)
(NASA-CR-2484) Avail: NTIS HC $7.00 CSCL 01C

A flight test and data processing program utilizing a Northrop F-5A aircraft instrumented to acquire buffet pressures and response data during transonic maneuvers is discussed. The data are presented in real-time format followed by spectral and statistical analyses. Also covered is a comparison of the aircraft response data with computed responses based on the measured buffet pressures. Author

N75-12935*# Massachusetts Inst. of Tech., Cambridge. Aeroelastic and Structures Research Lab.
A STUDY OF GUST RESPONSE FOR A ROTOR-PROPELLER IN CRUISING FLIGHT
Masahiro Yasue Aug. 1974 237 p refs
(Contract NAS2-7262)
(NASA-CR-137537; ASRL-TR-174-1) Avail: NTIS HC $7.50 CSCL 01C

Equations of motion for a rotor-propeller aircraft in cruising flight have been developed and implemented in a computer program. The formulation is based on Galerkin's method using coupled mode shapes for the blade and wing. This procedure is applied to the analysis of two types of rotors, gimballed rotor and hingeless. The results are evaluated by means of eigenvalue analysis of the stability of the system and frequency response analysis of the gust and control response. Author

N75-12936# National Aeronautical Establishment, Ottawa (Ontario).
FLIGHT LOADS ON LARGE AIRCRAFT ENGAGED IN 1974 BUDWORM SPRAYING PROGRAM
G. S. Campbell Sep. 1974 29 p refs
(LTR-ST-733) Avail: NTIS HC $3.75

A large area of forest in the province of Quebec was sprayed by aircraft in the annual program to protect against spruce budworm. Three of the four aircraft types used were large 4-engine piston airplanes, converted from their original role of passenger aircraft. Spraying was done at altitudes of 300 ft. to 400 ft. above ground level and so the aircraft were subjected to a more severe load spectrum than would be experienced in the normal airline operation for which they were designed, resulting in a decrease in their expected fatigue life. The loads on several of the aircraft were monitored with solid state acceleration level counters and a total of 79.6 hours of data representing aircraft design stress levels were obtained for subsequent analysis. Results of the study are provided. Author

N75-12937*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
CALCULATION OF THE TWIST DISTRIBUTION OF WINGS DESIGNED FOR CRUISE AT TRANSONIC SPEEDS
Michael J. Mann Washington Dec. 1974 25 p refs
(NASA-TN-D-7813; L-9832) Avail: NTIS HC $3.25 CSCL 01C

The use of linear theory in calculating the twist distribution of a wing designed for cruise at supercritical speeds is justified on the basis of the transonic equivalence rule. A modified version of Multhopp's subsonic lifting-surface theory was used to calculate the twist distribution. The lifting-surface theory is compared with both slender wing theory and experimental results. A study was also made of the effect of wing sweep on the twist distribution required to maintain an elliptic span load at cruise conditions. The important parameters used in establishing this twist distribution are identified. Author

N75-12938*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SUBSONIC ROLL-DAMPING CHARACTERISTICS OF A SERIES OF WINGS
Richmond P. Boyden Washington Dec. 1974 39 p refs
(NASA-TN-D-7827; L-8854) Avail: NTIS HC $3.75 CSCL 01B

The aerodynamic damping in roll of a series of wings has been investigated in the Langley high-speed 7- by 10-foot tunnel at Mach numbers ranging from 0.2 to 0.8 by use of a forced oscillatory-roll technique. Tests were conducted on wings of aspect ratio 6 with sweep angles of 25, 35, and 45 deg and on 35 deg swept wings of aspect ratios 4 and 5. Author

N75-12939*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EXPERIMENTAL INVESTIGATION OF THE CORNERING CHARACTERISTICS OF 18 BY 5.5, TYPE 7, AIRCRAFT TIRES WITH DIFFERENT TREAD PATTERNS
Robert C. Dreher and John A. Tanner Washington Dec. 1974 21 p refs
(NASA-TN-D-7815; L-9795) Avail: NTIS HC $3.25 CSCL 01C

The characteristics, which include the cornering-force and drag-force friction coefficients and self-alining torque, were obtained on dry, damp, and flooded runway surfaces over a range of yaw angles from 0 deg to 12 deg and at ground speeds from approximately 5 to 90 knots. The results indicate that a tread pattern with pinholes in the ribs reduces the tire cornering capability at high yaw angles on a damp surface but improves cornering on a dry surface. A tread pattern which has transverse grooves across the entire width of the tread improves the tire cornering performance slightly at high speeds on the flooded runway surface. The cornering capability of all the tires is degraded at high ground speeds by thin film lubrication and/or tire hydroplaning effects. Alterations to the conventional tread pattern provide only marginal improvements in the tire cornering capability which suggests that runway surface treatments may be a more effective way of improving aircraft ground performance during wet operations. Author

N75-12940*# Boeing Commercial Airplane Co., Seattle, Wash.
UPPER-SURFACE BLOWING NACELLE DESIGN STUDY FOR A SWEPT WING AIRPLANE AT CRUISE CONDITIONS Final Report
W. B. Gillette, L. W. Mohn, H. G. Ridley, and T. C. Nark Washington NASA Sep. 1974 126 p refs
(Contract NAS1-12214)
(NASA-CR-2427; D6-41763) Avail: NTIS HC $5.75 CSCL 01C

A study was made to design two types of overwing nacelles for an existing wing-body at a design condition of Mach = 0.8 and C sub L = 0.2. Internal and external surface contours were developed for nacelles having either a D-shaped nozzle or a high-aspect-ratio nozzle for upper-surface blowing in the powered-lift mode of operation. The goal of the design was the development of external nacelle lines that would minimize high-speed aerodynamic interference effects. Each nacelle type was designed for both two- and four-engine airplanes using an iterative process of aerodynamic potential flow analysis. Incremental nacelle drag estimates were made for flow-through wind tunnel models of each configuration. Author

N75-12941*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
WIND TUNNEL INVESTIGATION OF A SIMULATED GUNSHIP HELICOPTER ENGINE-EXHAUST-WINDSTREAM INTERACTION
John C. Wilson and Raymond E. Mineck Washington Dec. 1974 71 p refs Prepared in cooperation with Army Air Mobility R and D Lab., Hampton, Va.
(NASA-TM-X-3161; L-9923) Avail: NTIS HC $4.25 CSCL 01C

A wind tunnel investigation of the engine exhaust and windstream flow interaction on a gunship helicopter model was conducted in the Langley V/STOL tunnel. The investigation utilized a flow visualization technique employing neutrally buoyant helium filled bubbles to determine the cause of exhaust shield overheating during cruising flight and to evaluate means of eliminating the problem. The flow patterns were recorded with still cameras and on television magnetic tape. Exhaust flow impingement on the exhaust shield during cruise was found to cause the problem. Several flow altering devices were evaluated to find suitable ways to correct the problem. A flow deflector located on the model cowling upstream of the exhaust provides an effective solution. Author

N75-12942# AiResearch Mfg. Co., Torrance, Calif.
FEASIBILITY STUDY AND DEMONSTRATION OF NITROGEN GENERATION FOR FUEL TANK INERTING Final Report, Jul. 1972 - Jun. 1974
Scott A. Manatt Jun. 1974 216 p refs
(Contract DOT-FA72WA-3140)
(AD-784950; FAA-RD-74-112) Avail: NTIS HC $5.75

Nitrogen fuel tank inerting has been shown to be an effective means of providing aircraft explosion prevention by reducing the O2 concentration below the lower limit for fuel vapor ignition. A reduction of O2 concentration to a level of 9% or less is sufficient to produce an incombustible environment for jet fuels and potential ignition sources. Generation of an inert gas from air has been investigated to reduce the weight and logistics penalities associated with inert gas storage. System requirements have been defined using the McDonnell Douglas DC-10 as a transport aircraft representative of potential applications. The study concluded that both the catalytic combustion of air with turbine engine fuels and air seperation by hollow fiber permeable membranes are viable candidates. Author

N75-12943*# Wichita State Univ., Kans.
DEVELOPMENT OF A FOWLER FLAP SYSTEM FOR A HIGH PERFORMANCE GENERAL AVIATION AIRFOIL
W. H. Wentz, Jr. and H. C. Seetharam Washington NASA Dec. 1974 115 p refs Prepared for Kanas Univ. Center for Res., Inc.
(Grant NGR-17-002-072)
(NASA-CR-2443) Avail: NTIS HC $5.25 CSCL 01C

A two-dimensional wind-tunnel evaluation of two Fowler flap configurations on the new GA(W)-1 airfoil was conducted. One configuration used a computer-designed 29-percent chord Fowler flap. The second configuration was modified to have increased Fowler action with a 30-percent chord flap. Force, pressure, and flow-visualization data were obtained at Reynolds numbers of 2.2 million to 2.9 million. Optimum slot geometry and performance were found to be close to computer predictions. A C sub L max of 3.8 was achieved. Optimum flap deflection, slot gap, and flap overlap are presented as functions of C sub L. Tests were made with the lower surface cusp filled in to show the performance penalties that result. Some data on the effects of adding vortex generators and hinged-plate spoilers were obtained. Author

N75-12944# General Dynamics/Convair, San Diego, Calif. Aerospace Div.
WEAPON SYSTEM COSTING METHODOLOGY FOR AIRCRAFT AIRFRAMES AND BASIC STRUCTURES. VOLUME 4: ESTIMATING TECHNIQUES HANDBOOK Interim Technical Report, Jul. 1972 - Sep. 1973
R. E. Kenyon Apr. 1974 77 p refs
(Contract F33615-72-C-2083; AF Proj. 1368)
(AD-785375; AFFDL-TR-73-129-Vol-4) Avail: NTIS CSCL 01/3

This report presents the interim results of a study aimed at extending cost estimating techniques developed and demonstrated under a previous contract. The previous study provided a trade study and a system study costing method for empennage elements. During the initial phase of the current study, these capabilities have been extended to include all aerodynamic surfaces: horizontal stabilizer, vertical stabilizer, canards treated as a stabilizer, and wings, including secondary structure. This volume provides a handbook as a guide to the trade study cost estimating technique. The function of the computer program is described. The program output format and the input data requirement and its organization are discussed and reference is provided to the cost estimating logic involved. Author (GRA)

N75-12945# Army Air Mobility Research and Development Lab., Hampton, Va.
HELICOPTER GROUND RESONANCE ANALYSIS IN LIGHT OF ARMY REQUIREMENTS
Charles E. Hammond 1974 16 p refs
(AD-785628) Avail: NTIS CSCL 01/3

The Army has in recent years refined its methods of procuring aircraft. Until recently the Army had only procured aircraft which were more or less off-the-shelf items. That is, the aircraft were either developed for other military services or for civilian use and were adapted to meet Army needs. As a result, the Army was not significantly involved in the writing of specifications which affected the overall design of the vehicle. Operational experience has indicated, however, the need for specifications which reflect the particular requirements of Army aviation. This paper is concerned with requirements which have been imposed in the area of helicopter mechanical instability, or ground resonance as this phenomenon is commonly known, and the impact which these requirements have on the analyst. GRA

N75-12946# Kaman Aerospace Corp., Bloomfield, Conn.
DEVELOPMENT OF A METHOD FOR THE ANALYSIS OF IMPROVED HELICOPTER DESIGN CRITERIA Final Report
Ross F. Metzger, Arved Plaks, Richard C. Meier, and Alex Berman Jul. 1974 215 p refs
(Contract DAAJ02-72-C-0064; DA Proj. 1F1-62208-AA-82)
(AD-783392; R-1172; USAAMRDL-TR-74-30) Avail: NTIS CSCL 01/3

A method has been developed to allow the evaluation of helicopter design criteria. Analytical models have been developed which include mission analysis, performance relationships, statistical and analytical weight predictions, mission effectiveness (including payload utilization data and environmental statistics), and fixed and operational cost estimations. The models are specifically designed to determine the cost effectiveness of a two-point design criterion. A computer program known as ZODIAC 2 was developed to implement these and other analytical models. A user's guide for the program and illustrative computations are presented. Author (GRA)

N75-12951*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INFLUENCE OF MIXER NOZZLE VELOCITY DECAY CHARACTERISTICS ON CTOL-OTW JET NOISE SHIELDING
U. VonGlahn and D. Groesbeck 1974 19 p refs Presented at the 13th Aerospace Sci. Meeting, Pasadena, Calif., 20-22 Jan. 1975; sponsored by AIAA
(NASA-TM-X-71631; E-8168) Avail: NTIS HC $3.25 CSCL 20A

Jet noise shielding benefits for CTOL engine-over-the-wing configurations were obtained with model scale multitube and lobed mixer nozzles and various shielding surface geometries. Spectral data were obtained with jet velocities from 585 to 1110 ft/sec. Correlation equations for predicting jet noise shielding benefits with single conical nozzle installations were modified to correlate the mixer nozzle data. The modification included consideration of the number of nozzle elements and the peak axial velocity decay in the flow field adjacent to the shielding surface. The effect of forward velocity on jet noise attenuation by a shielding surface is discussed. Author

N75-12954# Advisory Group for Aerospace Research and Development, Paris (France).
DISTORTION INDUCED ENGINE INSTABILITY
Oct. 1974 182 p refs Lecture series held at London, 7-8 Nov. 1974, at Wright-Patterson AFB, Ohio, 11-12 Nov. 1974, and Philadelphia, 14-15 Nov. 1974
(AGARD-LS-72) Avail: NTIS HC $7.00

The design criteria for jet aircraft engines and turbomachinery to obtain minimum airflow distortion and engine instability is discussed. The sources of distortion are identified. The aerodynamic and mechanical response of selected engines under distorted flow conditions are analyzed. Techniques for predicting and measuring the stability of an engine are described. Methods for increasing the tolerance of the engine to distorted flow in order to obtain more stable operation are explained.

N75-12955 Naval Postgraduate School, Monterey, Calif.
INTRODUCTION TO DISTORTION INDUCED ENGINE INSTABILITY
Allen E. Fuhs *In* AGARD Distortion Induced Eng. Instability Oct. 1974 19 p refs

Propulsion system instability, which may be caused by distorted inlet flow, is a recurring problem which must be solved in each new aircraft development program. Trends in engine and airframe design that keep distortion sensitivity as a continuing problem are discussed. Sources of inlet flow distortion are catalogued. This information is used to assess the potential difficulties in development of a variety of aircraft types. Methods for describing distortion both experimentally and conceptually are introduced. Sufficient background is stated to provide a perspective of the lecture series. Author

N75-12956 Societe Nationale d'Etude et de Construction de Moteurs d'Aviation, Villaroche (France).
SOURCES OF DISTORTION AND COMPATIBILITY
R. Bouillet and J. M. Brasseur *In* AGARD Distortion Induced Eng. Instability Oct. 1974 11 p refs

An analysis of the sources of flow distortion and operating compatibility for jet aircraft engines was conducted. The aspects of flow distortion considered are: (1) various operating cases of air intakes, (2) air intake design and engine compatibility, (3) test facilities required to compensate the lack of theoretical data and to confirm predictions, and (4) typical examples of air intake modifications aiming at significant improvement of the internal flow. The conditions of operation considered are normal operation in which the velocity field around the aircraft in an assumed infinite atmosphere is the only factor considered, and operation under conditions of disturbances from ground effect. Author

N75-12961 Pratt and Whitney Aircraft, East Hartford, Conn.
METHODS TO INCREASE ENGINE STABILITY AND TOLERANCE TO DISTORTION
A. A. Mikolajczak and A. M. Pfeffer *In* AGARD Distortion Induced Eng. Instability Oct. 1974 17 p refs

Techniques used during engine design which ensure stable engine operation over the complete flight envelope of the aircraft in which it is installed are discussed. Adequate stability margin is required to allow for the expected levels of inlet distortion, engine to engine variations, engine aging and excursions of compressor operating lines during transients. Since the stability margin can be increased by raising the surge line of a compressor, increasing its tolerance to inlet distortion and modifying the design to reduce the sensitivity to transients, all these topics are treated in some depth. Emphasis is placed on the design for adequate stability margin and minimum penalty in engine fuel consumption, cost and weight. Author

N75-12962# Aeronautical Research Labs., Melbourne (Australia).
CONSTANT VOLUME GAS TURBINE: FURTHER EXPERIMENTS ON A SLEEVE-VALVED COMBUSTOR WITH GASEOUS FUEL
M. Zockel and A. Runacres Jun. 1974 28 p refs
(ARL/ME-NOTE-350) Avail: NTIS HC $3.75

The feasibility of a gas turbine using constant volume combustion is investigated. Experiments using an improved sleeve-valved combustor burning gaseous propane fuel are described. The combustor had a greater length/diameter ratio than the earlier version and was found to give a better combustion pressure rise. The pressure rise was at fuel-air ratios required for gas turbine operation less than 50% of fuel-air ratios required to demonstrate a feasible engine combustion system. The combustor has the problems of excessive valve leakage and seizure of the rotating sleeve under hot operation conditions. The results indicate the need for designs in which the valve is separate from the combustor and the combustor arranged to achieve improved mixture stratification. Author

N75-12964# Booz-Allen Applied Research, Inc., Bethesda, Md.
AIRCRAFT TAXIING NOISE MEASUREMENTS Final Report
Robert L. Hershey and Louie Turner, III Aug. 1974 137 p refs
(Contract DOT-FA72WA-2823)
(AD-787235; FAA-RD-74-114) Avail: NTIS HC $5.75

Taxiing noise measurements performed at Atlanta airport included passby noise measurements of taxiing planes and ambient noise samples from the terminal roof and inside the terminal building. The primary purpose of these measurements was to determine whether changes in noise level result from shutting off some engines during taxiing for fuel conservation and air pollution reduction. Analysis of noise data showed that although the noise levels of individual planes on the taxiways were reduced by engine shutoff, the noise environment of the air terminal building was unaffected. Measurements of taxiway passbys and stationary engine runups indicated that engine shutoff procedures reduce passby levels by 5 dbA for the DC-8 and 2 dbA for the 727. The reduction is 10 dbA for the DC-9 when measured on the side with the engine shutoff. Author

N75-12965# Federal Aviation Administration, Washington, D.C. Systems Research and Development Service.
STOL NOISE PREDICTION AND ATTENUATION MODELS IN SUPPORT OF REGULATORY EFFORT Final Report
Joseph K. Power Apr. 1974 86 p refs Presented at Joint Intern. Short Course: STOL Aircraft Technol. and the Community, 22-26 Apr. 1974; sponsored by Univ. of Tennessee Space Inst. and Tech. Univ., Aachen, Germany
(AD-777569; FAA-RD-74-70) Avail: NTIS HC $4.00

For commercial STOL aircraft, the most critical design parameter is the noise level. The impact of existing and expected noise regulations on the development of STOL aircraft is discussed. Models for STOL noise prediction are presented, as well as noise reduction mechanisms and a ranking of V/STOL aircraft noise sources. Author

N75-12966# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EXPERIMENTAL STUDY OF RESONANCE VIBRATIONS OF VARIED-FREQUENCY ROTOR BLADES OF AN AXIAL-FLOW COMPRESSOR
I. E. Zablotskii and R. A. Shipov 17 Apr. 1974 29 p refs Transl. into ENGLISH from Lopatochnye Mashiny i Struynye App. Sb. Statei (USSR), no. 6, 1972 p 131-150
(AD-778520/7; FTD-HT-23-675-74) Avail: NTIS HC $3.75 CSCL 21/5

A method for studying the resonance vibrations of axial flow compressor rotor blades under conditions of a slowly rotating peripheral nonuniformity of flow is presented. The equipment required and the procedures for conducting the tests are explained. The test instrument measures the amplitude of the blade-end displacements directly in a circumferential direction. A mathematical relationship is developed to determine the vibration characteristics based on the measured parameters. Author

N75-12967*# Rensselaer Polytechnic Inst., Troy, N.Y. Systems Engineering Div.
DIGITAL ADAPTIVE FLIGHT CONTROLLER DEVELOPMENT
Howard Kaufman, Gurbux Alag, Paul Berry, and Samir Kotob Washington NASA Dec. 1974 123 p refs
(Grant NGR-33-018-183)
(NASA-CR-2466) Avail: NTIS HC $5.25 CSCL 01C

A design study of adaptive control logic suitable for implementation in modern airborne digital flight computers was conducted. Two designs are described for an example aircraft. Each of these designs uses a weighted least squares procedure to identify parameters defining the dynamics of the aircraft. The two designs differ in the way in which control law parameters are determined. One uses the solution of an optimal linear regulator problem to determine these parameters while the other uses a procedure called single stage optimization. Extensive simulation results and analysis leading to the designs are presented. Author

N75-12972# Ohio Univ., Athens. Avionics Engineering Center.
EXPERIMENTAL VALIDATION OF BOEING 747 ILS SIGNAL SCATTERING CALCULATIONS FOR CRITICAL AREA DETERMINATION Final Report, Sep. 1973 - Apr. 1974
Robert A. Rondini and Richard H. McFarland Jan. 1974 73 p refs
(Contract DOT-FA74WA-3361)
(AD-787609; FAA-RD-74-57; EER-18-1) Avail: NTIS HC $4.25

Charts showing recommended designated critical areas for aircraft parking on an airdrome are presented. These have been derived from data taken from extensive mathematical modeling of the effects of the Boeing 747 on the ILS signal in space and the recently completed experimental validation of these mathematical models. Presented also are contour charts which can be used to analyze the effects on the ILS of parking a Boeing 747 at specific locations on the airdrome. Author

N75-12974# Sola Basic Industries, Goldsboro, N.C. Hevi-Duty Electric Div.
APPROACH LIGHT SYSTEM (ALS). MULTIPLE DISTRIBUTION SYSTEM REDESIGN Final Report
Richard P. Marek Mar. 1974 85 p refs
(Contract DOT-FA71WA-2633)
(AD-786682; ESR-95; FAA-RD-74-47) Avail: NTIS HC $4.75

Recommendations for an Approach Light System (ALS) distribution system to provide a lower cost system without sacrificing reliability are presented. The distribution system is changed from a series output circuit system to a multiple type with constant voltage using parallel step-down transformers in place of the series to series transformers presently in use. The design concepts for Urban Residential Distribution (URD) are used to provide smaller and more compact major components. Author

N75-12975# National Aviation Facilities Experimental Center, Atlantic City, N.J.
EVALUATION OF AN EXPERIMENTAL ELEVATED HIGH-INTENSITY RUNWAY EDGE LIGHT Interim Report, Jun. 1973 - Mar. 1974
E. Leon Reamer Sep. 1974 67 p
(FAA Proj. 072-324-000)
(AD-785016; FAA-NA-74-23; FAA-RD-74-128) Avail: NTIS HC $4.00

The suitability of a newly designed elevated runway edge light to function in category I and category II operations when a high-intensity runway-light environment is prevalent was investigated. The work involved laboratory photometric measurements and analysis of pilot response after test flying the newly designed runway lighting system. The results of the tests indicated that the new design concept is appropriate for use under the conditions tested. Author

N75-12980# Hazeltine Corp., Greenlawn, N.Y.
MICROWAVE LANDING SYSTEM (MLS) DEVELOPMENT PLAN AS PROPOSED BY HAZELTINE CORPORATION DURING THE TECHNIQUE ANALYSIS AND CONTRACT DEFINITION PHASE OF THE NATIONAL MLS DEVELOPMENT PROGRAM. VOLUME 1: SYSTEM CONCEPT AND INTEGRATION
27 Sep. 1973 425 p
(Contract DOT-FA72WA-2804; FAA Proj. 075-325-013)
(AD-778215; FAA-RD-73-185-Vol-1) Avail: NTIS HC $9.00

The design and operational concept of a microwave landing system are discussed. The baseline system is designed to provide the very low angle coverage as required by the use of vertical directivity. The major features include the provision of planar coordinates from unitary Doppler antennas, which do not require airborne computation. A modular approach is provided to permit the separation of conventional takeoff and landing aircraft and short takeoff and landing operations as required. A special feature of the baseline approach is pattern emphasis, or increased reference antennas gain, along the runway centerline so as to reduce illumination of multipath sources to the side of the runway centerline. Author

N75-12981# Hazeltine Corp., Greenlawn, N.Y.
MICROWAVE LANDING SYSTEM (MLS) DEVELOPMENT PLAN AS PROPOSED BY HAZELTINE CORPORATION DURING THE TECHNIQUE ANALYSIS AND CONTRACT DEFINITION PHASE OF THE NATIONAL MLS DEVELOPMENT PROGRAM. VOLUME 2: MULTIPATH, SHADOWING
27 Sep. 1973 608 p
(Contract DOT-FA72WA-2804; FAA Proj. 075-325-013)
(AD-778118; FAA-RD-73-185-Vol-2) Avail: NTIS HC $13.00

The design and operational aspects of a Doppler microwave landing system are discussed. Emphasis is placed on the problems created by multipath, shadowing, and terrain considerations. The proposed method for reducing the errors caused by multipath transmission is explained. Diagrams of the systems components and the antennas radiation patterns are provided to explain the propagation problems. Mathematical models are included to support the theoretical presentation. Author

N75-12982# Federal Aviation Administration, Washington, D.C. Systems Research and Development Service.
INTERNATIONAL MICROWAVE LANDING SYSTEM (MLS) SYMPOSIUM
Apr. 1974 471 p refs Presented at the Intern. Microwave Landing System Symp., Washington, D. C., 30 Nov. - 4 Dec. 1973
(AD-779312; FAA-RD-74-56) Avail: NTIS HC $9.25

The proceedings of a symposium on international microwave landing systems are presented. The research and development programs conducted by various European countries, England, Australia, and the United States are discussed. The operating characteristics of the various systems are analyzed and the functions of the system components are reported. The advantages of the various systems are explained.

N75-12983 Service Technique de la Navigation Aerienne, Paris (France). Radiocommunication and Navigation Dept.
PRESENTATION OF A DIFFERENT MLS CONCEPT
Olivier Carel *In* FAA Intern. Microwave Landing System (MLS) Symp. Apr. 1974 5 p

The development and operation of a ground derived instrument landing system are discussed. The system is under development in France. The equipment is compatible with an air-ground data link function for air traffic control purposes. The ground derived system uses a signal transmitted from the aircraft, the ground station locates the aircraft and sends its position through a coded information channel. Sensors are installed on the airport and measured data concerning the aircraft position and direction can be processed in such a way that the aircraft will receive angle and distance information from standard origins. Author

N75-12984 Service Technique de la Navigation Aerienne, Paris (France).
A TIME ORDERED ACCESS GROUND DERIVED MLS CONCEPT
J. Lovet *In* FAA Intern. Microwave Landing System (MLS) Symp. Apr. 1974 26 p

The functional characteristics, technical characteristics, and research and development program for a microwave landing system based on a time-ordered access, ground-derived concept are discussed. The time ordered access ground derived system is organized by the ground station. It is therefore possible to avoid garbling on the air-ground link, while using this channel to a maximum. The ground-air data link carries transmission instructions and sends back measurements made on the ground. The techniques for angular measurements depend on interferometer and Doppler systems. Diagrams of the system are provided and an example of the system in use is analyzed. Author

N75-12985 Civil Aviation Administration, London (England).
UNITED KINGDOM PROPOSAL FOR A FUTURE ICAO PRECISION APPROACH AND LANDING GUIDANCE SYSTEM
Mike F. Whitney *In* FAA Intern. Microwave Landing System (MLS) Symp. Apr. 1974 7 p

A research and development program for an instrument landing system is discussed. The program investigated aspects of microwave landing systems such as: (1) non-commutative Doppler scanning-beam techniques, (2) conventional scanning beam techniques, (3) air-derived ranging systems, (4) microwave propagation, (5) instrument landing system and microwave landing system colocation, (6) terminal area interface, and (7) interferometric techniques for aircraft guidance. A projected time table for accomplishing the various phases of the research project is provided. Author

N75-12986 Royal Aircraft Establishment, Farnborough (England). Radio Dept.
MAJOR RESULTS OF THE ROYAL AIRCRAFT ESTABLISHMENT PHASE 1 AND PHASE 2a PROGRAMMES
J. M. Jones *In* FAA Intern. Microwave Landing System (MLS) Symp. Apr. 1974 40 p

Performance tests of microwave instrument landing systems based on automatic approach control are discussed. Tests were conducted of (1) flight elevation system, (2) azimuth tracking system, (3) runway profile effects, (4) instrument landing system substitution, (5) effects of multiplexing, and (6) signal propagation measurements. Diagrams of the systems and the method of operation are provided. Author

N75-12987 Plessey Radar Ltd., Havant (England).
UNITED KINGDOM PHASE 2 PROGRAMME
Ronald S. Barratt *In* FAA Intern. Microwave Landing System (MLS) Symp. Apr. 1974 28 p

The development and characteristics of a commutated Doppler aircraft landing system are discussed. The Doppler approach provides a continuous signal and a natural self coding of space, as a function of the receiver's angular position. The basic elements of the system and other facilities to be added to the basic system satisfy more demanding environments. The test equipment used in the evaluation and the procedures for conducting the tests are reported. Author

N75-12988 Royal Aircraft Establishment, Farnborough (England).
UNITED KINGDOM MLS PROGRAMME: PHASE 2 FEASIBILITY DEMONSTRATION TRIALS PROGRAMME
J. M. Jones *In* FAA Intern. Microwave Landing System (MLS) Symp. Apr. 1974 7 p refs

An evaluation program for the feasibility demonstration of a microwave landing system is described. Tests were conducted on individual subsystems and total system performance using ground and airborne measurements. The tracking facilities, timing equipment, and flight profiles are defined. A diagram of the airport is provided to show the location of the system components. A schedule of the tests is included. Author

N75-12989 Department of Civil Aviation, Melbourne (Australia).
INTERSCAN: A NEW NON-VISUAL PRECISION APPROACH AND LANDING GUIDANCE SYSTEM FOR INTERNATIONAL CIVIL AVIATION
Egon Stern and J. P. Wild (CSIRO) *In* FAA Intern. Microwave Landing System (MLS) Symp. Apr. 1974 35 p refs

The development and characteristics of a nonvisual aircraft instrument landing system are discussed. The system is based on the use of a scanning beam antenna for transmitting the azimuth, elevation, and flare guidance from ground based subsystems. The signal format for the five guidance functions is analyzed. The configuration of the complete system is diagrammed to show the location of the components along the runway. A time schedule of the flight test activities is presented. Author

N75-12990 Bundesanstalt fuer Flugsicherung, Frankfurt am Main (West Germany).
THE GERMAN MLS PROGRAM: DLS, DME BASED LANDING SYSTEM INTRODUCTION AND PROGRAM OVERVIEW
Tilman H. Bohr *In* FAA Intern. Microwave Landing System (MLS) Symp. Apr. 1974 13 p

The characteristics of a distance measuring equipment based landing system (DLS) are described. The system provides a mixture of ground derived data (azimuth and elevation) and air derived data. These data are exchanged in such a way that the relevant data are available in the air as well as on the ground. The time schedule for the development program is analyzed and the goals of the research program are defined. Author

N75-12991 Standard Electrik Lorenz A.G., Stuttgart (West Germany).
SYSTEM PRESENTATION (STATUS)
Manfred Boehm *In* FAA Intern. Microwave Landing System (MLS) Symp. Apr. 1974 29 p

The concept and operation of the distance measuring landing systems (DLS) are explained. The basic signal flow of the system is illustrated. The distance measuring interrogations are measured with regard to their angles of incidence by two ground stations, one being the azimuth station and the other being the elevation station. The distance measuring equipment replies transmitted by the azimuth station are used to carry the angle information back to the interrogation aircraft. The elevation station employs, in addition to the circular array, a linear vertical array, which provides the conical information, and together with the cosine components of the horizontal circular array, the planar elevation. The horizontal circular array provides the flare azimuth. Components of the system are diagrammed to show the principles of operation. Author

N75-12992 Standard Electrik Lorenz A.G., Stuttgart (West Germany).
TECHNOLOGY OVERVIEW
Guenter Peuker *In* FAA Intern. Microwave Landing System (MLS) Symp. Apr. 1974 18 p

The technology aspects of the distance measuring equipment landing system (DLS) are discussed. The transfer of technology from previous systems to the current development is described. The ground based and airborne components of the system are analyzed to show the interrelated functions. Photographs of the components are provided. Author

N75-12993 Ministry of Transport, Ottawa (Ontario).
STOL DEMONSTRATION PROGRAM: CANADA
G. J. Taylor *In* FAA Intern. Microwave Landing System (MLS) Symp. Apr. 1974 10 p

Performance tests of a microwave landing system for short takeoff aircraft are discussed. The tests include the following: (1) measurements of absolute signal strength, (2) refracted signals, and (3) the effects of snow, ice, and snow banks along the runway. Communications equipment tests to determine applications for microwave propagation data and to identify the propagation problems with emphasis on refraction and precipitation effects are reported. Author

N75-12994 Hazeltine Corp., Greenlawn, N.Y.
DOPPLER MICROWAVE LANDING SYSTEM AS DEVELOPED BY HAZELTINE CORPORATION
Henry W. Redlien *In* FAA Intern. Microwave Landing System (MLS) Apr. 1974 38 p

The development of a microwave landing system based on the Doppler principle is discussed. The objectives of the feasibility demonstration of the system are defined. Emphasis is placed on an engineering approach which permits providing the high performance and accuracy required in the high density terminal and at the same time permits the design of low-cost airborne and ground equipment for general aviation and small airports. Diagrams of the equipment and typical airport installations are provided to show the nature of the limited and full scale capabilities. The types of antennas used in the system are described and drawings of their configurations are included. Author

N75-12995 ITT Gilfillan, Inc., Van Nuys, Calif.
THE ITT GILFILLAN DOPPLER MICROWAVE LANDING SYSTEM
R. E. Hull, Ronald A. Rosien, and Lon L. Sanders *In* FAA Intern. Microwave Landing System (MLS) Symp. Apr. 1974 24 p
(Contract DOT-FA72WA-2805)

The development and characteristics of a Doppler microwave landing system are discussed. The major decisions and system engineering considerations are shown as: (1) commutated Doppler application, (2) all C-band format, (3) conical antenna types, (4) equipment modularity, and (5) time division multiplex format.

The decisions related to the means of providing flare guidance are explained. Diagrams of the flare guidance element are shown to describe the operational limitations. Photographs of the system modules are provided. Author

N75-12996 Bendix Corp., Towson, Md.
THE BENDIX MICROWAVE LANDING SYSTEM (MLS)
E. D. Hart and Robert Kelly *In* FAA Intern. Microwave Landing System (MLS) Symp. Apr. 1974 42 p refs

The characteristics of a microwave landing system using air derived data system techniques operating at C-band microwave frequencies are discussed. Angular position of the aircraft is measured by reference to ground generated fan beams that are electronically scanned in their narrow direction across broad coverage sectors in both azimuth and elevation. An airborne receiver/processor extracts modulated angle data, corresponding to the line-of-sight angle, from the ground scanning beam antenna to the aircraft. Range measurements are made by airborne interrogation of a ground distance measuring transponder. An aircraft can obtain precision azimuth angle, elevation angle, range and range rate data referenced to a runway, suitable for visual display to a pilot or as automatic inputs to the flight control system. Author

N75-12997 Texas Instruments, Inc., Dallas.
THE TEXAS INSTRUMENT MICROWAVE LANDING SYSTEM
R. M. Lockerd *In* FAA Intern. Microwave Landing System (MLS) Symp. Apr. 1974 73 p

The development and operation of a microwave landing system are discussed. The basic guidance technique uses scanned fan beams with angle information encoded on a frequency modulated subcarrier with the range system being a high precision C-band distance measuring equipment. A diagram of a typical airport installation is provided. The most important characteristic of the system is the performance of the equipment in the multipath environment. The primary causes of electromagnetic interference are identified and the methods for reducing the interference effects are described. Performance tests of the system were conducted and preliminary results are tabulated. Author

N75-12998 Air Transport Association of America, Washington, D.C.
THOUGHTS ABOUT THE MICROWAVE LANDING SYSTEM FROM A USER PERSPECTIVE
S. B. Poritzky *In* FAA Intern. Microwave Landing System (MLS) Symp. Apr. 1974 12 p

The desired characteristics of microwave landing systems are described. The performance of air-derived data system is compared with the performance of ground-derived data systems. The rationale for the development of microwave landing systems to replace the conventional instrument landing systems is analyzed. The types of systems which will provide the minimum capability for airports in underdeveloped nations are examined. Author

N75-12999 British Airways, Middlesex (England).
AN INTERNATIONAL OPERATORS VIEW ON MLS
G. E. Selves *In* FAA Intern. Microwave Landing System (MLS) Symp. Apr. 1974 11 p

Operational views to be considered by designers of approach and landing guidance systems for aircraft are expressed. The operational views are presented from the standpoint of the international operator and a member airline are analyzed. It is stated that the long term objective for operators is to install airborne systems that provide that ability to navigate with the minimum reliance on ground based facilities to include the approach and landing phase. The limitations of the present instrument landing systems are analyzed. A tabulation of the radio aids currently installed in civil aircraft for international operation is provided. Diagrams of typical aircraft are included to show the location and types of communication and navigation equipment installed. Author

N75-13000 Lincoln Lab., Mass. Inst. of Tech., Lexington.
SYSTEM SELECTION CONSIDERATIONS
James E. Evans *In* FAA Intern. Microwave Landing System (MLS) Symp. Apr. 1974 46 p

The considerations involved in the development and operation of microwave landing systems are analyzed. The economic aspects of the systems are investigated. Specific technical problems which are discussed are: (1) traffic capacity, (2) frequency allocations, (3) propagation effects in a multipath environment, (4) data rate, and (5) reliability and integrity of the system. Diagrams of the electromagnetic radiation features of the microwave landing system are provided. Author

N75-13170# Westinghouse Electric Corp., Lima, Ohio. Aerospace Electrical Div.
HIGH TEMPERATURE GENERATOR COMPONENT DEVELOPMENT Final Technical Report, May 1972 - Jun. 1974
Robert C. Fear, Allen E. King, and William E. Neff Aug. 1974 238 p refs
(Contract F33615-72-C-1626; AF Proj. 3145)
(AD-786046; AFAPL-TR-74-69) Avail: NTIS CSCL 09E

Investigations of high temperature generator designs and generator components such as insulations, magnetic materials, diodes, and bearings for operation in a 600 F high altitude ambient are described. Interlaminar insulation coatings for cobalt iron magnetic sheet steels were investigated and best choices are identified. A new coil insulation system in the form of a rugged monolithic structure was developed using a new ceramic tape and an encapsulation of a compound of commercial glass. Dry lubricated bearing technology developments were extended to more than double the life over previous similar bearings. High temperature SiC diode technology developments were extended to more than double the rating over prior SiC diodes. A conceptual design of a lighter weight, higher power density synchronous generator utilizing these new components is presented having a specific weight of 2.3 lbs/kVA. Author (GRA)

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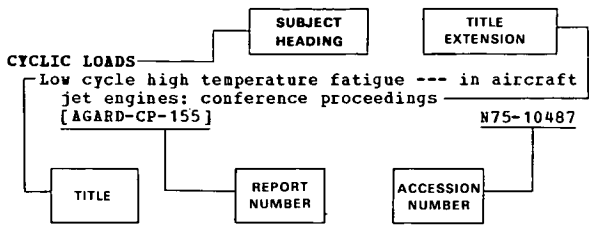

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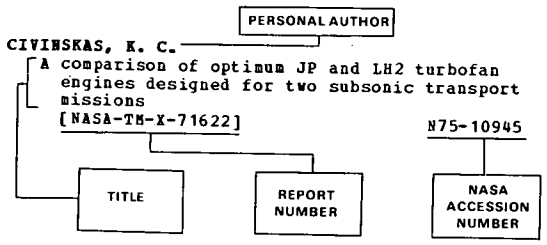

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